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A Celebrated Street-Lighting Case

WITH the close of testimony in the Boston Edison street-lighting rate case a few days since, one of the most notable proceedings in the history of central-station price regulation draws toward its end. The record in this famous case occupies nearly 10,000 pages of typwritten evidence. The presentation of this evidence consumed 122 days of public hearings, begun in the spring of 1916. If there is any phase of the problem of street-lighting cost which has not been discussed in these proceedings, it is because able lawyers and engineering experts of the highest reputation have unintentionally overlooked it.

A good deal of material from this case has appeared in our news and editorial columns from time to time, and we do not propose now to review it. But the magnitude of the case invites a few comments upon its scope. In breadth of inquiry it compares with the noted Bay State Street Railway fare case decided in 1916 by the Public Service Commission of Massachusetts. That case was a classic from the standpoint of appraisal detail; the Edison case, heard by the Massachusetts Gas and Electric Light Commission, is equally monumental in its attempt to evaluate the cost of street-lighting service in the city of Boston as a part of the total service rendered by the company in its territory of nearly 750 square miles.

The testimony in this case has had many angles. At the outset the Boston company introduced an exhibit upon which practically all subsequent proceedings have been based. This exhibit presented the Commission with the company's opinion as to the cost of the service under dispute, and month after month the proceedings have taken their course either in attack upon or defense of this exhibit. So thoroughly has the case been fought through that certain collateral aspects of it have become noteworthy studies in themselves.

One of these features was an investigation of the amount of auxiliary steam-plant capacity which appears desirable for a great metropolitan central-station system; another was an extended analysis of the serviceability of mechanical stokers in power-plant operation; and a third was a long inquiry into the carrying capacity of underground cables. So interesting were these investigations (all of which had a bearing upon the plant required to furnish the street-lighting service) that a number of manufacturers and public utility administrators went to the expense of securing verbatim copies of portions of the testimony for their engineering or administrative files. The daily newspapers followed the case with varying success, and it has of course aroused much interest among central-station men. There remain the arguments, set for early fall, and the analysis and decision of the Board.

It would be invidious to attempt to determine at this time whether the fixing of street-lighting rates in this case required such protracted proceedings. The busy executive and hard-pressed technical man is tempted to assert that the case could profitably have been shortened a half if the Commission had insisted upon it; but it is to be remembered that in this instance the Board sat as arbitrators under the express provisions of the contract between the city and the company. To a very large extent the Commission has been obliged to listen to whatever the parties considered material to their causes. Probably the Board will discuss the general problem of attempting to determine the cost of a particular service, in its decision to be rendered later. The desirability of attempting to harmonize all possible data bearing upon cost between the parties in such disputes has been emphasized in these columns. What the Commission will have to say regarding the company's elaborate computation of street-lighting costs will be of great interest to the public utility world.

Without an analysis of all factors we cannot pretend to pass upon the possibility of materially shortening these proceedings at this time without risk of doing one side or the other injustice, or perhaps reflecting upon the Board, which has no easy task before it. But one thing is sure, and that is, that if rate cases are generally to expand to the size of this one at Boston, the regulation of public utilities by state commissions will fall by its own weight. It is to be hoped that the vast amount of evidence preserved in this case will make it possible to shorten other proceedings of the same character at least within Massachusetts; that the arguments of the disputants and the future finding of the Commission may set a real standard to which work of this kind can be referred for a long time to come.

The Aeroplane and Wireless

WE have come upon that stage of the science of aeroplaning, when, to fly is not sufficient, it is also necessary to have the readiest means of communication. Fourteen years of development, with experiments without number, have added many accessories to the planes, but possibly none has aided the commercial value more than that of the radio. It keeps the birdman in constant touch with the land and sea from which he soars. It opens new and valuable uses for the machine.

War and military movements are known to have developed this modern mechanism as seldom if ever occurs with new inventions. It seems but yesterday when the Wright brothers were experimenting at Kitty Hawk, secretly delving into the simple principle of heavier-than-air flying. Today it is a thoroughly established means of rapid transit; a mint of money is being used in various ways for bringing it to its own; and the end is not yet.

For gun spotting, the French have used the radio in aeroplaning more than any other nation now at war. Rising at times to a height of 20,000 feet or more, they have kept closely in touch with their home base. Then, descending to a low level for observations, they have succeeded tactfully in getting back exact information as to the batteries, the locations of the Big Berthas. A certain French battery placed four shells in succession on a bridge 14 miles away; it was done by the use of the radio. And this feat has been repeated many times over. Following the example of the French, the British in the last great drive in Belgium, completely "blinded" the Imperial army by the extensive use of the aeroplane, equipped for ready communication. Its efficiency has increased to such an extent that it is not only proper to speak of aviation as the eyes of the army but the mouthpiece, as well. Despite the heavy cannonading, the roaring of the cannon, like reverberating thunder, messages are flashed back of the lines, and the awful work of destruction proceeds as if in plain sight—which is rarely the case. Even wireless telephony is in use.

The radio mechanism has been greatly simplified. It is no longer necessary to have stations of many exposed wires for receiving the messages. A pocket outfit will often serve for a radius of many miles. The Sperry brothers, of gyroscope fame, perfected an instrument of such compact dimensions that a seven-pound apparatus found a range of full 16 miles. Previous to this invention, the ratio was about two to four pounds per mile radius. And one pound per mile radius was considered extraordinary. With this latest outfit the radius is increased directly in proportion to the weight. And, in radiotelephony, the troublesome arc generator has been replaced by an oscillating vacuum valve. But in military maneuvres, it is not so much the intention to decrease the size of the outfit as to make it inviolable in emergencies.

America, originator of modern flying machines, has been officially apprised by the Allies that one of the greatest, if not the very greatest service which she can render, is a great army of trained aviators. This means an array of one hundred thousand sky-gliders, an army of ten thousand trained young men to man them. So practical have they proven, not so much as bomb-carriers but as message-bearers, that precedence is given the last powerful nation to specialize in this. And if it can be said that there is anything at all romantic about grim war, it is to be found in the air and not in the trenches. Without the radio, they would not be prized so highly as the eyes of the army.

The many aviation camps and fields throughout the country seem to attest the fact that the suggestion from abroad has met with favor. One training school alone, located near Dayton, Ohio, comprises a plot of twenty-five thousand acres, for hangars, living quarters and indoor instruction. Others will be less extensive but as truly scientific in management and plans. The country has awakened, after a long period of indifference, to see the efficiency of this branch of the service.

But, in peace times, what? The aero-radio is in its infancy. Unnumbered uses will be found.

Lieutenant C. K. M. Douglas, R. F. C. of England, made daily observations of the clouds in northern France in connection with the army work. He studied the formations of both stratus and cumulus clouds at close range. He made records of temperature and other conditions which he sent back. Meteorology and storm signals can be developed to a more helpful degree. Not long since one aviator gave warning of an approaching cyclone. Instead of smudge and fire signals, the radio can be used to warn of terrific storms and the exact course they are taking. At a height of 8,000 feet it is possible to see a distance of 100 miles. Derelicts at sea can be located and rescues made which would be otherwise impossible. In fact, wherever aviation is at all practicable the radio will extend and intensify its facilities for common use. Since the birds are speechless and not "in tune" for wireless messages, we must turn to the birdmen and the radio for our sky messages.

The Semi-Annual Index

The index for Volume 70, comprising the issues of January 6, 1917, to June 30, 1917, inclusive, is now ready for distribution and will be sent without cost to any subscriber requesting a copy. It has been the custom in the past to send the index as a supplement to the last issue of the volume, but in view of existing conditions the new arrangement is considered preferable.

HAPPENINGS IN THE INDUSTRY

American Institute Meeting in New York—Important Decision of Ohio Commission—Illinois Contractors' Convention—Ft. Wayne New-Business Meeting—Pennsylvania Contractors Meet—Miscellaneous News

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS HOLDS IMPORTANT SPECIAL MEETING.

New York Meeting in Place of Annual Convention Convention Considers Many Electrical Engineering Problems, Particularly Those Dealing With High Tension.

The special meeting of the American Institute of Electrical Engineers held in New York City on June 27 and 28 in place of the annual convention was well attended, over 180 being registered. Interest in the five sessions held during the two days was well sustained throughout. The meeting was opened Wednesday morning by President H. W. Buck, who explained that owing to the war it was demed advisable to hold only this special meeting instead of the regular annual convention which ordinarily would take four or five days. No entertainment features were provided, the meeting being devoted entirely to business.

Scheduled papers were then presented, as follows: "Problems in Operation and Maintenance of Underground Cables," by John L. Harper; "High-Tension Cable Joints," by D. W. Roper; "The Influence of Dielectric Losses on the Rating of High-Tension Underground Cables," by A. F. Bang and H. C. Louis; "Insulation Characteristics of High-Voltage Cables," by W. S. Clark and G. B. Shanklin.

Capt. Gustave Paul Cappart, a French engineer recently from the firing line, made an address in which he brought cordial greetings from the French engineers. Fortunately the slogan was "Time is Money"; now it is, "Time is Blood." This war is notably one of engineers and American engineers must contribute their part to make the world safe for demrocracy through victory.

The papers presented above were then discussed in a group by W. I. Middleton, Chester L. Dawes, Harry R. Woodrow and J. B. Whitehad. The discussion was continued at the opening of the afternoon session when D. Dubois, E. B. Meyer, John L. Harper and C. N. Rakestraw spoke. The authors of the papers closed the discussion on the respective subjects.

The papers scheduled forthe second session were then presented, as follows: "The Insulator Situation," by W. D. Peaslee; "Expansion Effects as a Cause of Deterioration in Suspension-Type Insulators," by J. A. Brundige; "Present Practice in Design and Manufacture of High-Tension Insulators," by A. O. Austin. Mr. Peaselee's paper was read by Harry R. Woodrow. The other two papers wer read by their authors. Written discussion was presented by Harris J. Ryan; the papers were further discussed by Harry R. Woodrow, J. C. Clark, E. E. F. Creighton, Edward M. Hewlett, Philip Torchio, Percy H. Thomas, John B. Taylor, C. Francis Harding and J. T. Barron, the authors closing the discussion. This session was presided over by L. T. Robinson, chairman of the Papers and the Metings Committee.

At the evening session on Wednesday President Buck, in his annual address, dealt with the relation and influence of the engineer in the affairs of his country and of the world, pointing out the urgent necessity for the enginer to expand from his own sphere and take his part in the active leadership of the affairs of the world.

President-elect E. W. Rice, Jr., was called upon to make an address, in which he expressed appreciation of his election. Referring briefly to the war, he said that the engineer must unquestionably take a leading and dominant position in all work in connection with the war. The electrical engineer, being the last world in engineering, must realize that this is his war in a personal and broad sense. C. O. Mailloux spoke of the great need for enginers in France and expressed hope that many American engineers would volunteer their services to aid our allies abroad.

Reports of the various technical committees of the institute were presented by their respective chairmen at this session.

On Thursday two sessions were held, at which the first was devoted to the general subject of mining. Two papers were presented, as follows: "Forms of Power Best Suited for Various Loads Encountered in the Operation of Bituminous Coal Mines," by R. L. Kingsland; "Test of a Large Mine Hoist," by R. S. Sage. At the afternoon session two papers were presented as follows: "Economical Combination of Water Power and Steam Plants and a Convenient Method of Solution," by H. S. Putnam; "Cooling of Oil-Immersed Transformer Windings After Shutdown," by V. M. Montsinger.

More detailed reports of these sessions will be given in our next issue.

OHIO COMMISSION MAKES IMPORTANT RATE RULING.

Decrees That City Councils Have No Right to Regulate Power Rates and Utilities May File New Rate Schedule Whenever Costs Change.

The Public Utilities Commission of Ohio, on June 2, made the following ruling in connection with the application of the Northwestern Ohio Railway & Power Company for leave to increase power rates:

"Contracts as to electric power are not binding in any way, even if same has been made part of a light ordinance in connection with domestic lighting, as city councils have not the authority or right to regulate power rates for any utility. And further, that each month the utility may file a supplemental rate based upon the actual cost of fuel, labor, material, etc., that have gone into the cost of production of power for that month. However, the Commission will not allow increase in ordinance rates to cities and villages for lighting purposes."

During the past few years many city councils in Ohio, in regulating commercial lighting rates, have included schedules of power rates in their ordinances. When the cost of production suddenly increased, a few months ago, mainly because of the increase in cost of fuel, the companies suffered a considerable loss of net revenue. The ruling of the Commission, above quoted, will prove a great relief to these companies.

NEW YORK LIGHTING COMPANIES' EMPLOYEES BUY $847,700 WORTH OF LIBERTY BONDS.

Over 80 Per Cent of All Employees Subscribe to Loan Through Efforts of General Committee.

New York City's utilities are to be congratulated for the success attending their efforts to dispose of Liberty bonds on behalf of the government. The General Committee was under the chairmanship of George B. Cortelyou, president of the Consolidated Gas Company. Taking the companies and the employees together, the aggregate results of the subscriptions cannot be far from ten millions of dollars.

The New York Edison Company furnished 4,817 subscribers, or a little over 80 per cent of the entire force, including all grades and every employee, whether temporary or permanently engaged, the amount of bonds subscribed being $303,050. Approximately the same percentage of the employees of the United Electric Light & Power Company subscribed $61,700, and 79 per cent of the employees of the New York & Queens Electric Light & Power Company subscribed $30,350.

Of the 5,827 employees of the Consolidated Gas Company and the associated gas companies, 5,052, or 87 per cent, subscribed $374,250. The aggregate of the lighting group of utilities in Greater New York was 12,357 employes, subscribing for $847,700 of the bonds.

One of the desirable results of this campaign is the extraordinary increase in the number of small security holders. Within this group alone there are nearly 13,000, which would probably be increased to 30,000, adding the other utilities of the Greater City, including the gas, electric light and street railways. The telephone subscriptions would add another large group.

ILLINOIS ELECTRICAL CONTRACTORS CONSIDER CO-OPERATIVE PLAN.

Discussion at Midsummer Meeting of Electrical Contractors Association of Illinois.

The midsummer meeting of the Electrical Contractors' Association of Illinois was held in Peoria, Ill., on Friday and Saturday, June 22 and 23. The meeting was opened by President J. N. Pierce who introduced National President Robley S. Stearnes who gave a brief outline of the work that the National Electrical Contractors' Association had in view and also a review of the work it had done. His address was very well received, as the spirit of co-operation outlined by him would be for the betterment of all the different branches of the electrical industry. Norman B. Hickox, sales manager of the National X-Ray Reflector Company, gave an illustrated talk on the proper lighting of show windows and showed by the use of slides and diagrams the proper distribution of light for the different style of windows.

Co-operation Between Central Stations and Contractors.

The afternoon session was given up to the subject of central-station co-operation and was opened by W. L. Goodwin, who gave an outline of the work that he had accomplished in California in getting the electrical manufacturers, jobbers, central stations and contractors into an association organized in such a manner that all were prospering and working together in a generous spirit of co-operation. He gave in detail the whole idea of the association, together with the necessary features that are needed to carry out a plan such as the California association has been following for the last three years. Mr. Schimpf, of the Illinois Traction System, which operates several properties in central Illinois, was called upon and said, while in the past this company had not been able to work with the contractors, that now it was co-operating with them, and monthly meetings were being held with them.

Mr. Scheel, of Joliet, gave an outline of the work being done in that city. The central station is co-operating with the contractor in securing contracts at such a price that the contractor could make a profit on the jobs. The same is true in all the towns in which the Public Service Company has plants. Mr. Lyons, of the Commonwealth Edison Company, gave a resume of the situation as existing in Chicago and as to how this company was working with the contractors.

A spirited discussion followed these talks during which the point was made that the central stations were willing to co-operate with the contractors if the latter were willing to do their share. This was the first Illinois convention that the representatives of the central stations have taken such a prominent part in the meeting, with the exception of the meeting last January in Chicago where the work of co-operation with central stations was first brought before the association as an important matter to be discussed.

The meeting on Saturday morning was opened by Walter Collins, of the P & B Company, of Milwaukee, Wis., who gave a talk on estimating both on the basis of lights and of openings, and then went in detail into the better system of estimating by units. This was covered fully and it was shown just how to arrive at the cost per unit. When this had been determined for a particular class of work it was a simple matter to estimate a similar job. On this basis it did not take much time to make a complete and reliable estimate and one that would result in a profitable job when the work was finished. Several members took part in the discussion of this paper and showed how they were in the habit of making estimates according to the local conditions.

The meeting then resumed discussion of central-station co-operation. C. F. Snyder, of the Bloomington & Normal Railway & Light Company, read a paper on "What Co-operation in the Industry Has Done for Us in Bloomington." He said that much of the success of the campaigns can be traced to the spirit of co-operation developed between the company and the contractors. In Bloomington there had been adopted a definite policy of fostering and ecouraging this spirit of business co-operation, not only between the company and the contractors but among the contractors themselves. The details of the manner of working were explained. Mr. Snyder said that newspaper advertising was the best way to secure results; it was a powerful selling force and brought direct results. In closing he said, "Nothing succeeds like success and where you find prosperous, satisfied contractors you will find a central station that is assisting and co-operating. It will pay direct dividends."

T. D. Buckwell, sales manager, Central Illinois Light Company, of Peoria, said that the plan outlined by Mr. Goodwin was a wonderful one and had reached all interests. He gave the results of a recent wiring campaign in Peoria. The spirit of co-operation had been fostered more by the work of the Peoria Electric Club, of which all men in the electrical industry are members, than any other thing in the city. He outlined the policy of his company as to the selling of appliances, all of which are sold at regular retail prices. He thought that if the contractors would stimulate their appliance sales, the central-station companies might be able to pay more attention to the selling of power.

J. M. Humiston, of Chicago, read a paper on the wiring of buildings for telephones. He had charts showing the conduit layout for a large office building and said that this was one field that the electrical contractor had overlooked and which was profitable work.

H. M. Butler, of Peoria was called upon to state the position of the jobbers. He explained the policy of his firm and said most of the spirit of co-operation shown in Peoria

was due to the activities of the Peoria Electric Club, where all the representatives of the different parts of the industry met on a common ground and thus were soon better acquainted. This fostered the spirit of co-operation.

BUSINESS SESSION.

The business meeting was held Saturday afternoon and it was the sense of the convention that steps be taken to work along the lines of the Goodwin co-operative idea.

The election of officers for the next fiscal year resulted in the re-election of all officers as follows: J. N. Pierce, Chicago, president; J. T. Marron, Rock Island, vice-president; L. B. Van Nuys, Peoria, secretary-treasurer; M. N. Blumenthal, Chicago, L. C. Crawley, Peoria, and E. F. Pendergast, Rockford, state directors; R. W. Poelma and William McGuineas, Chicago, and E. F. Pendergast, Rockford, national directors. Chicago was selected as the place to hold the semi-annual meeting in January.

A resolution was passed approving the action of the national directors in holding the national convention in New Orleans this fall.

In all it was the most profitable convention ever held by the Illinois association. The work of co-operating with the other divisions of the electrical industry, which was the big idea of the meeting and which will be followed up, will doubtless work to the benefit of all the members.

The entertainment features were not overlooked. They included a theater party and automobile ride for the ladies, with a lunch for all on the evening of the first day. Saturday noon the whole state convention was the guest of the Peoria Electric Club. The banquet followed by dancing was the closing event in the evening.

NEW-BUSINESS TOPICS DISCUSSED AT FT. WAYNE.

Committee of Indiana Electric Light Association Holds Convention on June 20.

An enthusiastic meeting of the New-Business Committee of the Indiana Electric Light Association was held in Fort Wayne, Ind., Wednesday, June 20, 1917, at the Anthony Hotel. The meeting was called to order by O. M. Booher, chairman, and introductory remarks were made by Charles B. Hart, new-business manager of the Fort Wayne & Northern Indiana Traction Company.

"Organization of New-Business Departments" was discussed in a paper by Thomas Donahue, of the Northern Indiana Gas & Electric Company, Lafayette. Mr. Donahue's paper was well put and to the point, covering a lot of the new-business managers' neglected duties and weak spots in perfecting a new-business organization, emphasizing the advisability of using sound business methods in merchandising both energy and appliances, elaborating the value of the canvass card to the departments, especially in the promotion of lamp-socket appliances.

This paper was discussed by H. T. Sharp, Evansville, C. B. Young, Rochester, S. Mott, Noblesville, P. C. Pfenning, Indianapolis, followed by a general discussion by the convention in general.

At 12:45 p. m. a luncheon was held at the Anthony Hotel at which J. M. Barrett, of Fort Wayne, acted as toastmaster. A very interesting address was given by F. S. Hunting, Fort Wayne, manager of the General Electric Works, on "The Government and Its Relation to Industries." Short talks were made by C. B. Fitch and E. W. Puckett, Mr. Fitch on "The Electrical Industry as It Was Forty Years Ago and What Might Be Expected Forty Years Hence," and Mr. Puckett gave a short but snappy talk on "Salesmanship."

At the afternoon session a paper entitled "Development of the Sale of Socket Appliances" was presented by Milton Henoch, of Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. Mr. Henoch's experience as an appliance campaigner afforded him material for a paper of keen interest to new-business managers, promoting appliance sales from a load building as well as a merchandising standpoint. Mr. Henoch had some figures on increased revenue from appliances that were very encouraging.

The fact that there were other appliances besides irons to build up the day load, irons being used but practically one day each week, while percolators, toasters, grills and other small appliances for a short time daily would show a greater increase on the month than the irons was pointed out.

The evolution of the central stations to the service company marked an advance in business progress which in some cases has gone beyond the sale of socket appliances, and in some cases dishes, glassware and kitchen conveniences have been added to help carry the overhead. Mr. Henoch also brought out the possibilities in what has been the heretofore somewhat neglected part of appliance sales, the use of lamp-socket appliances in the commercial districts, such as glue pots, soldering irons, sterilizers, immersion heaters and many others adaptable to most every business.

The co-operation of the manufacturers in spending thousands of dollars on national advertising for the promotion of appliance sales and how the central-station man should tie his windows and local advertising up with the national ads, price cutting, methods of campaigns and salaries and commissions were a few of the many good points in this paper that brought forth some discussions of equalment by W. H. Crawford, of Hammond, and M. V. Stagg, of Fort Wayne.

The paper entitled "Increasing Load-Factor of Existing Lines," by N. A. Perry, Indianapolis, was presented by Carlos Deitz in the absence of Mr. Perry.

Mr. Deitz emphasized the advisability of putting extra effort on the placing of lamp-socket appliances now with the present cost of materials and as a builder of the day load, taking several specific cases of various sized cities. A general discussion followed this paper.

All in all the convention was a success from every view and only shows that Indiana's central station new-business men are "Doing their bit" in the march of progress.

PENNSYLVANIA ELECTRICAL CONTRACTORS' ASSOCIATION.

Annual Convention Held in Philadelphia June 19-21—Officers Elected.

The annual convention of the Electrical Contractors' Association of Pennsylvania was held at Philadelphia, June 19-21, and proved one of the most successful in the history of the organization. More than one hundred delegates and representatives were present from various parts of the state and entered enthusiastically into the interesting program arranged by the local members under the auspices of the entertainment committee. Hotel Adelphia was selected as the convention headquarters, and the English Room in the basement of this well known hostelry was given over to an unusually fine public exhibit of electrical goods.

Several interesting papers were presented at the different meetings. On the opening day Washington Devereux, chief of the electrical department of the Philadelphia Fire Underwriters' Association, delivered an address on the subject of the carelessness shown in many homes in the use of electrical devices, stating that fifty-four thousand fires were caused during the past year by the overheating and neglect of different appliances when in use. Mr. Devereux set forth that the trouble was not with the devices, but with the human element—the woman who connected an electric iron or other appliance for service and forgot to shut it off when she left the house for a social call. He said that no father

should buy his young son a ten-cent book on "How to Wire the House in Your Spare Moments" unless he was prepared for a possible catastrophe.

M. Edwin Arnold, head of M. E. Arnold & Company, electrical contractors, Philadelphia, and president of the Association during the past year, held, in reply, that electricity was not the cause of the majority of fires, and combatted the arguments presented by Mr. Devereux; in proof of his assertions he read letters to the members from the Mayors of Asbury Park and Ocean Grove with reference to the recent disastrous conflagrations in these cities, which stated that these fires were not, as commonly assumed, caused by electricity. Mr. Arnold said in conclusion that every time electric wires were in evidence after a fire that the rubber stamp "electricity" was used when no other cause for the fire was apparent.

Joseph B. McCall, president of the Philadelphia Electric Company, addressed the members on the wider use of electricity for lighting, indicating the present neglected possibilities in this work and urging concentrated effort to encourage the wiring of homes, stores, and other places at every opportunity.

An illustrated talk on a timely subject was given by Charles M. Ripley, covering the proper protection of munition plants by a flood-lighting system or batteries of electric searchlights. Other interesting addresses were: "Selling the Electrical Idea," by H. W. Alexander, New York; "The Necessity for Competent Estimating," by John M. Hooley, New York; and "The Manufacturers' Territorial Agency," by Frank H. Stewart, head of the Frank H. Stewart Electric Company, Philadelphia.

The delegates and guests participated in the different entertainment features arranged by the local committee in enthusiastic and responsive manner, and each feature of the arrangements was carried out with great success, indicating the appreciation for the conscientious efforts of the local committee.

The following officers and directors were elected for the ensuing year:

President, Albert Gentel, head of Albert Gentel, Inc., electrical construction, 1503 Columbia Avenue, Philadelphia.

Vice-president, H. F. Hartman, of the Hartman Electric Construction Company, 137 Oakford Court, Scranton.

National Director, George E. Shepherd, of Shepherd & Rust, electrical contractors, 42 West Market Street, Wilkes-Barre.

Legislative Committee, Mr. Hartman and Mr. Shepherd, vice-president and national director, respectively, as noted above, together with R. C. Williams, Jr., Philadelphia, and John S. Musser, Harrisburg.

M. G. Sellers, 1518 Sansom Street, Philadelphia, was re-elected as secretary and treasurer.

The electrical exhibit in the English Room of the hotel was continued from June 19 to 23. It was a very successful event. Not only was the display well patronized by the attending delegates and guests, but the many others from the city and vicinity took time to look over the attractive array of electrical appliances.

Several of the most enterprising of the local electrical contractors arranged for daily announcements in the different Philadelphia papers in the form of collective advertisements of quarter-page size, calling attention to the electrical exhibit and extending a cordial invitation and welcome to visit the show. Among those participating in this co-operative idea were The Buchanan Electric Store, 1719 Chestnut Street; Albert Gentel, Inc., 1503 Columbia Avenue; Walker & Kepler, 531 Chestnut Street; Frank H. Stewart Electric Company, 37-39 North Seventh Street; M. E. Arnold & Company, 114 North Eleventh Street; Schimmel Electric Supply Company, 318 Market Street, and others. These announcements proved highly effective and created additional interest in the exhibit.

LYNN SECTION, A. I. E. E., ELECTS OFFICERS.

Section Has Made Progress During the Year—Average Attendance High.

The final meeting of the year took place on June 20, when J. Morton Davis of the order department of the General Electric Company was elected chairman and Robert D. Thomson, secretary-treasurer. A. K. Warren and C. H. B. Halvorson are on the executive committee, and among those on other committees are Dr. L. C. Lowenstein, Jesse M. Darke, A. T. Comstock and David C. Lash. The chairman of the executive committee is F. W. Ralston.

After the election Walter C. Fish, manager of the Lynn plant of the General Electric Company, Gordon M. Campbell, the past chairman, and A. R. Ellis of the standardizing laboratory at Lynn, made addresses, Mr. Ellis speaking on "Meter Instrument Bearings."

The total number of members the past season was reported by the retiring secretary, M. B. Carroll, to be 844, the largest in the history of the section. The average attendance at the lectures was 250; receipts for the year approximately $3,500, and the present assets of the section nearly $2,000.

BOARD OF GOVERNORS OF ASSOCIATED MANUFACTURERS MEET.

Various Sections Elect Chairmen for Ensuing Year—No Meetings During Summer.

The Board of Governors of the Associated Manufacturers of Electrical Supplies held a meeting at the offices of the Association, 30 East 42nd street, New York City, on Wednesday, June 20, at 2:30 p. m. H. B. Crouse, president, presided, and there was a full attendance. Many matters of importance were considered and a number of new lines of activities planned. The Board will hold no meetings during the summer months, unless by special call, the next regular meeting coming in September.

On Wednesday evening, June 20, the various chairmen of Sections of the Associated Manufacturers of Electrical Supplies were the guests of the Board of Governors at a round table dinner at Delmonicos. C. E. Patterson, comptroller of the General Electric Company and chairman of the Cost Accounting Committee in the Electrical Manufacturers' Council, was also a guest, as were the cost experts of the companies of the Section chairmen. Mr. Patterson discussed the matter of cost accounting very fully, inviting comments from those present and explaining in detail many points of interest. A number of other matters of importance to the Sections were discussed and various Section activities planned. Covers were laid for about forty guests and it was felt by all that the evening was a thoroughly enjoyable one.

Outlet-Box Section Meeting.

The Outlet-Box Section of the Associated Manufacturers of Electrical Supplies held a regular meeting on Tuesday, June 19, at the offices of the Association. Frank W. Hall, of the Sprague Electric Works, chairman of the section, presided, practically all members of the Section being present. The meeting was a very interesting one and many subjects of importance were discussed. Among other activities considered was the establishment of a Bureau for Industrial Statistics, which will be handled through the office of the general secretary.

The Porcelain Section of the Associated Manufacturers of Electrical Supplies held its regular meeting at the offices of the Association on Thursday, June 21, J. E. Way, of R. Thomas & Sons Company, presiding. The various stand-

ing committees of the Section made reports and other matters of importance were discussed. The regular election of officers was postponed until the next regular meeting of the Section.

ELECTION OF SECTION OFFICERS.

At recent meetings of the Sections of the Association elections of officers were held, and the following chairmen were elected for the coming year:

Attachment Plug Section, H. W. Bliven, Harvey Hubbell, Inc.

Fan Motor Section, John H. Barker, Diehl Manufacturing Company.

Fuse Section, H. R. Sargent, General Electric Company.

Knife Switch Section, J. H. Trumbull, Trumbull Electric Manufacturing Company.

Lamp Receptacle and Socket Section, W. D. Steele, Benjamin Electric Manufacturing Company.

Lighting Fixture Section, A. F. B. Harraden, Shapiro & Aronson.

Panelboard and Switchboard Section, Charles L. Eidlitz, Metropolitan Electric Manufacturing Company.

Snap Switch Section, E. Whitmore, Manhattan Electric Supply Company.

ANNOUNCEMENT OF THE SOCIETY FOR ELECTRICAL DEVELOPMENT'S "KEEP BUSINESS GOING" CAMPAIGN.

New Books on Business Efficiency for Electrical Men Prepared for General Circulation.

The Society for Electrical Development has mailed to its entire mailing list a broadside circular announcing its "Keep Business Going" campaign.

The circular contains, among other things, an important letter to the industry signed by Henry L. Doherty, president of the Society. It suggests that in view of the greatly widened market for electric service in many fields, it is time to lay aside petty jealousies in the industry and concentrate on building business.

The possibilities of electric power to replace steam power, of electric light to protect bridges, munition plants, water ways and workshops, of electrical appliances to lighten the labor of the home and on the farm, were, according to the circular, never so great as at this moment.

The Society urges the sales side of the industry not to let down in its efforts, but to seek out new possibilities of serving the public. It suggests that many power consuming devices, which formerly might have been thought to be luxuries, are now certainly proved to be necessities.

The keynote of the new campaign is that business must be kept going if the banks, merchants, lighting companies and other commercial interests are to contribute their share to the national defense.

The Society has already prepared a number of valuable business books for the use of the industry in the present situation and has others in preparation. These books deal with various phases of merchandising for appliances, equipment and service. The newest of these books gives a list of more than 3,000 applications of electricity to various businesses, industries and commercial life in general, all especially needful in carrying out the government's proposed economies of time, money and men.

The Society has also inaugurated a special power-application service for providing its members with data for use in developing power prospects. This service brings into play the engineering and power-development side of the Society's staff in a new way and greatly increases its usefulness to both central station, dealer and contractor, as factors in the sale of motors, appliances and service.

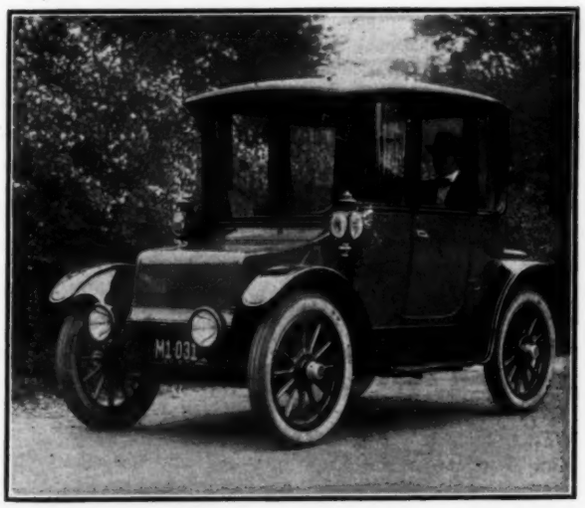
ELECTRIC MAKES RUN FROM ATLANTIC CITY TO NEW YORK IN SIX HOURS.

Demonstration Made Under Auspices of Electric Vehicle Association Proves Value of Electric for Touring.

That the electric automobile is admirably adapted for long runs has just been proven by an inter-city run made from Atlantic City to New York City on Tuesday, June 19, under the auspices of the New York Electric Vehicle Association. The run is a blow to old traditions about the electric passenger car being favorable for only short trips.

The test was conducted purely to demonstrate the electric's speed and endurance and to show that it is not alone the ideal lady's city car but is also a man's road car, a capable and hardy machine. Its performance compared creditably with the best performances of gasoline driven cars over the same route. It is even doubtful if a greater speed than was accomplished by this electric would be demanded by the average motorist and it is certain that a greater speed would not be legal. The run was made in a Baker R & L stock car of a new model, the features of which are that it is lower hung, offering consequently less wind resistance, and increased battery space.

The car left New York on Monday morning, June 18, with a driver and official observer for the New York Electric Vehicle Association. The trip to Atlantic City, which



Electric Vehicle Which Made Run from Atlantic City to New York in 5 Hours and 58 Minutes.

was chiefly to investigate road conditions, was made in the comfortable time of less than eight hours, no special effort being made to make a record in speed, the plan being to make the speed effort for the return trip.

The run from Atlantic City to New York was made in 5 hours and 58 minutes, actual running time, with a boost of one hour and a half at Lakewood. The mileage covered by the car from Atlantic City to New York was 123.5 miles, making the average running time 20.5 miles per hour. The entire distance was covered with the car running at fifth and sixth speed.

One of the startling features brought out by this trip was that the current used to drive the car from Atlantic City to New York cost less than half the price of enough gasoline to drive a gas car over the same route. Two hundred and eighty three ampere-hours were used in the run, an average of 2.29 per mile, the cost of which at five cents per kilowatt-hour, which is the maximum charging rate in New York City, would make the cost $1.55.

WESTINGHOUSE CAPACITY TO AGGREGATE $120,000,000.

Merger with Westinghouse Machine Company and Completion of Essington Plant Makes Possible Business of $10,000,000 a Month.

The merger of the Westinghouse Machine Company into the Westinghouse Electric & Manufacturing Company and the construction of the new plant at Essington will mean an electrical machinery manufacturing company capable of doing $120,000,000 of business per annum.

The Westinghouse Electric itself took in during April and May electrical business amounting to $15,000,000, or at the rate of $90,000,000 per annum. The May business was $8,000,000. The Westinghouse Machine Company is doing close to $800,000 of business a month, or at an annual rate of about $9,000,000. The new Essington plant when completed will be able to handle $15,000,000 gross a year. All told, the Westinghouse Electric & Manufacturing Company, within a year or two (when the Essington unit is ready for full operation) will be a $120,000,000 per annum concern, with the same capitalization as at present, according to careful estimates.

The tendencies in modern industrial operations are decidedly toward increasing use of electrical machinery of all kinds. The waste in operation of isolated small steam power plants compared with concentration in central steam electric generating units (especially with the unprecedented prices for fuel), the prospect of extensive hydroelectric work, the increasing use by railroads of electric power in numerous branches of service, and the big field in equipment of shipping are some of the factors on which may be predicted a demand for the output of the electrical companies on a scale never approached before. In fact, some of these demands are already taxing the capacity of the plants.

As the Essington plant comes into operation it is probable that the business of the Westinghouse Machine Company will gradually be transferred thereto, leaving its facilities added to the East Pittsburgh plant available for turbine, generator, etc., work.

FUND OF $375,000 CREATED FOR RED CROSS IN ADDITION TO REGULAR DIVIDEND—NEW VICE-PRESIDENTS ELECTED.

At the regular meeting of the Board of Directors of the Westinghouse Electric & Manufacturing Company held in New York on Wednesday, June 20, an extra dividend of one-half of one per cent on both common and preferred stock was declared for the benefit of the Red Cross fund. This dividend, which will amount to approximately $375,000, is an addition to the regular quarterly dividend of 1¾ per cent on both common and preferred stock, which was also declared.

At this meeting the annual election of officers of the company was held, resulting as follows:

Chairman of the board, Guy E. Tripp; president E. M. Herr; vice-presidents, L. A. Osborne, Charles A. Terry, and H. P. Davis; acting vice-president, T. P. Gaylord; comptroller and secretary, James C. Bennett; assistant secretary, W. H. Jones; assistant treasurer and assistant secretary, S. H. Anderson; auditor, F. E. Craig, and assistant auditor, W. B. Covil, were re-elected to their respective offices. Three new vice-presidential offices were created and the following were elected to fill same: Henry D. Shute and Herbert T. Herr, both of Pittsburgh, and Walter Cary of New York. H. F. Baetz, assistant treasurer, was elected to succeed Mr. Shute in the position of treasurer. L. W. Lyons was elected assistant treasurer to succeed Mr. Baetz and W. J. Patterson was elected to the newly created position of assistant auditor.

Biographical data concerning the new officers will be found on other pages of this issue.

ELECTRICAL CONTRACTORS TO HOLD ANNUAL CONVENTION.

Executive Committee Meeting in Chicago Adopts Slogan "Business Must Go On."

The quarterly meeting of the Executive Committee of the National Electrical Contractors' Association was held in Chicago, June 19 and 20, at the Hotel La Salle. There was a full attendance at this meeting and many subjects of the utmost importance were discussed, and will be put in the proper channel to be acted upon at the New Orleans convention in October. This was the most successful meeting ever held by the Executive Committee. An extensive nation-wide propaganda was entered into, which is expected to put the National Electrical Contractors' Association on an equal with the foremost organizations of the country.

There attended, by invitation, William L. Goodwin, formerly of California, but now from New York, who is giving much time to the proper organization of industry; J. M. Wakeman, general manager of the Society for Electrical Development; E. McCleary, one of the foremost and influential contractors in Detroit; Louis Kalischer, local contractor of New York; Ernest Freeman, of the Freeman-Sweet Company, of Chicago, former president of the N. E. C. A., and Mr. Hilton, treasurer of the organization, of Syracuse.

The national president, Colonel Robley S. Stearnes, was present from New Orleans, and used every endeavor to have the association keep up its work and assured the committee that New Orleans was ready in every manner to receive the membership of the National and hoped that under present conditions throughout the country, that each member would remember that this is going to be a very important meeting and that each should make every reasonable sacrific to attend, more especially for the reason that there will be put for final action, complete change in the constitution and by-laws, as a majority of the membership demands this and it will be settled at that time. The slogan adopted by the Executive Committee, at this meeting, was "Business Must Go On."

A resolution was passed with regard to the annual convention, to be held in New Orleans, La., October 10 to 13, inclusive, as follows:

Whereas, It is of the highest importance that the United States, having entered into the great war, should use every endeavor to bring it to a successful issue, and whereas this can only be accomplished by every individual and every business concern doing its utmost to *"Keep business going,"* and endeavoring by every available means to increase the business of the country so that it can carry the necessary financial burden;

Resolved, That the N. E. C. A. hold its annual convention at the time and place already agreed upon, to wit, in New Orleans, La., October 10 to 13; and

Resolved, That the N. E. C. A. pledges its active support to the movement by which every business man agrees to do his part in carrying on mercantile enterprises, including the preparations of all electrical systems for the added demands which may be made upon them.

Central Electric Company Subscribes $25,000 to Red Cross Fund.

Chicago's contribution to the Red Cross fund was materially augmented last week by the subscription of $25,000 by the Central Electric Company, which declared an additional dividend for this purpose. This action was taken promptly and whole-heartedly, on the initiative of G. A. McKinlock, president, and Charles E. Brown, secretary, of the company. This company had previously purchased Liberty Bonds in the amount of $100,000.

The Reactance of Strap Conductors

Formulas and Curves for Finding Reactance of Ventilated Busbars and Similar Subdivided Rectangular Conductors with Typical Examples of Such Determinations in Simple Circuits

By H. B. DWIGHT

THE reactance of a circuit composed of strap conductors is a useful quantity to know wherever rectangular conductors are used to carry alternating currents. Common instances of this are switchboard busbars and electric furnace circuits.

It is possible to calculate with fair accuracy the inductance of widely spaced straps by the approximate formula,

$$L = 2 \log s/(a+b) + 3 \qquad (1)$$

lines per centimeter of strap, where s is the axial spacing, and a and b are the dimensions of the section of the strap, measured in the same units as s. This is derived from the approximate formula for the inductance of a rectangle made of strap conductor, given in the *Bulletin* of the Bureau of Standards, Vol. 8, No. 1, equation No. 108.

This formula is plotted in Fig. 1, where it is seen to agree almost exactly with the curve for conductors of square section. For thin straps at close spacings the formula is quite inexact, and at very close spacings it actually gives negative values of reactance. Accordingly, when $s/(a+b)$ is less than about 2, formula (1) should not be used even for approximate work, but the curves of Fig. 1 should be used instead.

Since formula (1) is accurate within less than one per cent for values of $s/(a+b)$ greater than 2, it is useful to change it so as to use practical units. It then becomes:

Inductance $= [140.4 \log_{10} s/(a+b) + 91.4]\ 10^{-9}$ henrys per foot of strap, or

Reactance at 60 cycles $= 52.9 \log_{10} s/(a+b) + 34.5$ microhms per foot of strap. The reactance at other frequencies will be changed in proportion to the frequency.

It is possible to write out an exact formula for the inductance of two long conductors of rectangular section, neglecting skin effect, but it contains such a large number of terms that it is not useful as an engineering formula and so is not given here. Instead, the results have been plotted as a series of curves in Fig. 1, which can be used for the solution of problems. The reactance at 60 cycles of straight rectangular conductors, symmetrically placed as indicated in Fig. 1, can be taken directly from these curves, and the curves may also possibly be used in connection with the calculation of the reactance of shell-type transformers.

Sufficient data for obtaining the formula for the inductance of two long equal rectangular conductors, when the axes and the sides of the sections are parallel, can be obtained from the *Bulletin* of the Bureau of Standards, Washington, D. C., Vol. 3, No. 1, equation 8, and Vol. 8, No. 1, equations 116 and 124. The geometrical mean distances of squares in different positions indicated in Fig. 16 of Vol. 3, No. 1 are also useful in plotting the curves shown in this article.

The formulas for inductance when the straps are infinitely thin are comparatively short. When the straps are in parallel planes, that is, when a/b is zero, the inductance of the single-phase circuit is

$$L = 2 s^2/b^2 \log s/b - (s^2/b^2 - 1) \log (1 + s^2/b^2) + 4 s/b \tan^{-1} b/s$$ lines per centimeter of strap.

The values of this are shown by the upper curve of Fig. 1.

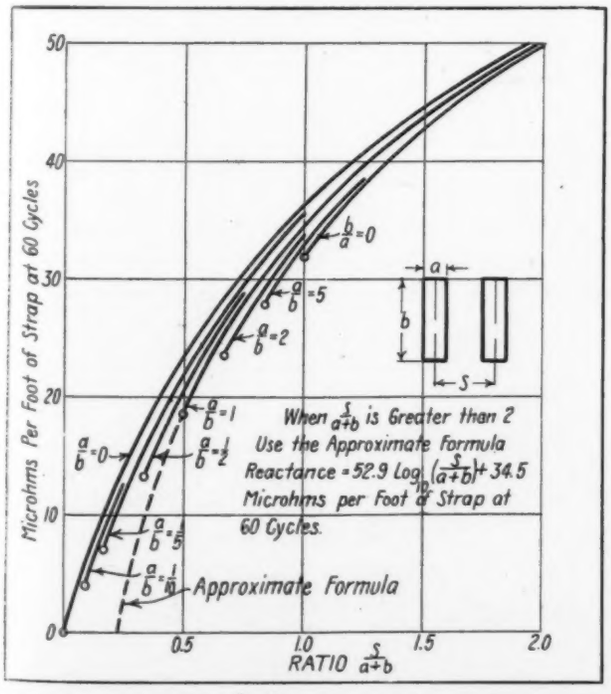


Fig. 1—Curves for Finding Reactance of Strap Conductors at 60 Cycles.

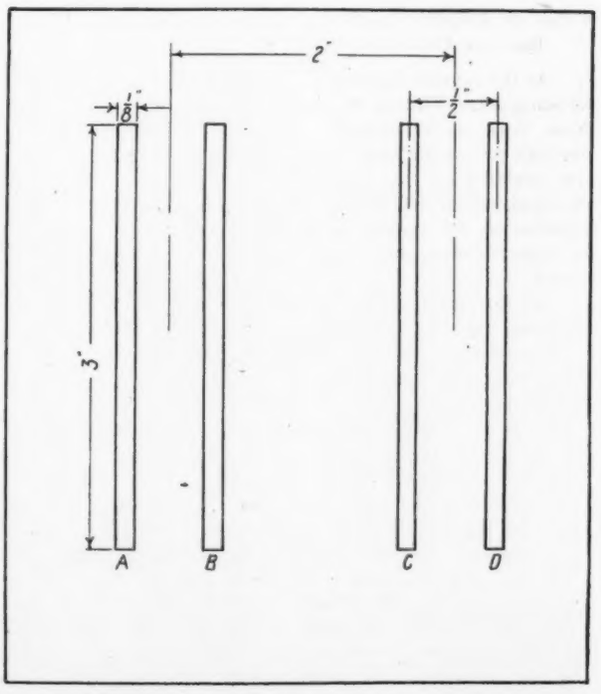


Fig. 2—Example of Ventilated Busbars for 60-Cycle Single-Phase Circuit.

When the straps are in the same plane, that is, when they lie edge to edge, b/a is zero, and the inductance is

$$L = (s/a+1)^2 \log (s/a+1) + (s/a-1)^2 \log (s/a-1) - 2s^2/a^2 \log s/a$$

lines per centimeter of strap. The values of this formula are given by the lowest curve of Fig. 1.

It is to be noticed that only ratios of the spacing, width and thickness of the straps appear in the expressions for inductance and in Fig. 1, and so these dimensions may be measured in any units, so long as they are all measured in the same units.

The curves of Fig. 1 are in agreement with the formula for inductance of thin straps very close together, neglecting skin effect.* This formula is a straight-line formula, and when plotted on Fig. 1, the straight line is found to be the tangent to the curve for thin straps at the position where the straps touch. It is possible to calculate the magnitude of the skin effect for this limiting position, and, as shown in Fig. 3 of the article mentioned in the footnote, skin effect reduces the self inductance when the frequency is high or when the section of the strap is very large. This reduction will take place to some extent for all positions indicated in Fig. 1 of this article.

Examples are given of the use of the curves of Fig. 1. The reactance, as plotted in the curves, is proportional to the difference between the self inductance and the mutual inductance, and this fact is used in solving problems of polyphase circuits and divided conductors. Such problems are more common than the more simple case of Example I, especially since most heavy strap conductors are of the built up or ventilated type. These general methods can also be applied to problems with divided conductors, etc., where wires or cables are used instead of straps.

Example I.

Find the reactive drop at 800 amperes, 60 cycles, in a single-phase circuit composed of two copper straps, each 90 feet long, size ¼ inch by 4 inches, in parallel planes, with one-inch spacing between centers of straps.

$a/b = 1/16$, and $s/(a+b) = 1/4.25 = 0.235$

Reactance = 12.4 microhms per foot of strap.

Reactive drop $= 800 \times 12.4 \times 90 \times 2 \times 10^{-6} = 1.79$ volts.

Example II.

Find the reactive drop at 800 amperes, 60 cycles, in a three-phase circuit composed of three copper straps, each 90 feet long, size ¼ inch by 4 inches, in parallel planes, with one-inch spacing between centers of straps.

Let the three straps side by side be called A, B and C, and let

$I_A = 800$ amperes,

$I_B = -400 + j\,400\sqrt{3}$ amperes, and

$I_C = -400 - j\,400\sqrt{3}$ amperes.

The reactive drop in A per foot

$= 2\pi \times 60\,[I_A L_A + I_B M_{AB} + I_C M_{AC}]$

where L_A is the self inductance of A per foot and M_{AB} is the mutual inductance of A and B per foot.

Since $I_A = -(I_B + I_C)$ the reactive drop in A per foot

$= 2\pi \times 60\,[I_B (M_{AB} - L_A) + I_C (M_{AC} - L_A)]$

$= -I_B X_{AB} - I_C X_{AC}$ where X_{AB} is the reactance per foot of the single-phase circuit composed of A and B. This can be obtained from Fig. 1.

$X_{AB} = 12.4$ microhms per foot of strap, as in Example I.

$X_{AC} = 22.0$ microhms per foot of strap.

Therefore the total reactive drop in A

$= (400 - j\,400\sqrt{3})\,12.4 \times 90 \times 10^{-6} + (400 + j\,400\sqrt{3})\,22.0 \times 90 \times 10^{-6}$ volts

$= 1.24 + j\,0.60$ volts

$= 1.38$ volts, numerical value.

The reactive drop in B

$= -I_C X_{BC} - I_A X_{AB}$

$= (400 + j\,400\sqrt{3})\,12.4 \times 90 \times 10^{-6} - 800 \times 12.4 \times 90 \times 10^{-6}$ volts

$= -0.45 + j\,0.77$ volts

$= 0.89$ volts, numerical value.

The reactive drop in C has the same numerical value, 1.38 volts, as the reactive drop in A.

A circuit of this kind is usually not transposed, and the unbalanced voltage drop will cause an unbalance in current and phase as well as voltage. The average reactive drop is 1.22 volts per leg, which should be expressed as a percentage of the star voltage.

Example III.

Find the reactance drop in single-phase ventilated busbars at 1000 amperes, 60 cycles, each busbar consisting of two straps 60 feet long, ⅛ inch by 3 inches at ½ inch centers. The distance between centers of the busbars is 2 inches. See Fig. 2.

Neglecting eddy currents, each strap will carry 500 amperes. The drop in A per foot is

$500\,(L_A + M_{AB} - M_{AC} - M_{AD})\,2\pi \times 60$

$= 500\,(L_A - M_{AC} + L_A - M_{AD} - L_A + M_{AB})\,2\pi \times 60$

$= 500\,(X_{AC} + X_{AD} - X_{AB})$

$= 500\,(27.4 + 31.6 - 9.0) \times 10^{-6}$ volts per foot, using Fig. 1.

The total drop in A is $500 \times 50.9 \times 10^{-6} \times 60$

$= 1.50$ volts.

Similarly, the drop in B is

$500\,(X_{BC} + X_{BD} - X_{AB}) \times 60$

$= 500\,(22.5 + 27.4 - 9.0)\,10^{-6} \times 60$

$= 500 \times 40.9 \times 10^{-6} \times 60$

$= 1.227$ volts.

The difference in voltage drop between A and B will be equalized by a redistribution of current, or an eddy current, as it is often called. The average reactive drop in the busbar is 1.363 volts and the drop in the single-phase circuit is 2.73 volts.

For an approximate calculation, consider each busbar as a solid strap of the same outside dimensions as the ventilated busbars, namely ⅝ inch by 3 inches.

Then $a/b = 0.21$ *and* $s/(a+b) = 2/3.625 = 0.552$.

From Fig. 1, the reactive drop in the single-phase circuit is $1000 \times 23.8 \times 10^{-6} \times 60 \times 2 = 2.86$ volts.

Either of the above values of the reactive drop of the busbar could be used in calculating the reactive drop in a similar three-phase busbar circuit, as in Example II.

*Skin Effect of a Return Circuit of Two Adjacent Strap Conductors, by H. B. Dwight, The Electric Journal, page 157, April, 1916.

Steel and Electrical Equipment Needed for Shipyards.

Ten ship-building companies of the United States and Canada are reported as buying structural steel for plant extensions and as placing contracts for shop and power equipment. The Merchant Shipbuilding Corporation will require 10,000 tons of steel for ways and shops on the Delaware River. The Newport News Shipbuilding & Dry Dock Company has placed orders for new shop equipment and steel for one of its shops, and will require 8000 tons of steel for additional ways. The Baltimore Dry Dock & Shipbuilding Company has placed orders for several locomotive cranes for additional ways and requires 3000 tons of steel for shops. The Traylor Engineering & Manufacturing Company has issued a list of tools required for a new shipyard to be built at Cornwall, Pa. The Terry Shipbuilding Corporation, having a contract to build 20 composite boats of 2500 tons each for Emergency Fleet Corporation, requires 7000 tons of steel for ways and shops to be built on Savannah River, Savannah, Georgia. The contract price for the 20 steel boats to be built at Savannah is reported to be $10,000,000.

Compressed-Air Uses In Power Stations

A Discussion of the Advantages of Compressed Air for Cleaning, Repairing, Hoisting and Conveying, Pumping and Construction Work in Power Plants

By CHARLES A. HIRSCHBERG

ASK THE average power-station engineer if he is using compressed air in power-plant operations and the chances are he will reply that there is an air compressor in the power house, but it is there for shop use. It seems that this willing power-plant servant, compressed air, is so near that it is entirely overlooked.

It is true that the air compressor has been installed in the private industrial power plant primarily for shop use to operate a great variety of pneumatic devices, and only in the large central station has the air compressor been installed for power-plant service alone, due perhaps to the lack of shop facilities.

The advantages of having compressed air in the power station are many, and where the compressing plant is installed in the power house, it is a comparatively simple matter to obtain the necessary outlets to make the air readily available.

Broadly speaking, the uses of compressed air in the power plant may be divided into the following classes: Cleaning, repairing, hoisting and conveying, pumping, painting and construction work.

Cleaning.

Compressed air is not only clean in itself, but it is a wonderful cleaning agent. This is perhaps one of the most extensive uses to which the power plant can apply it.

Generators, engines, pumps, control boards, girders, trusses and walls are thoroughly cleaned of dust by means of the compressed-air jet. The process is safe and does not injure the parts being cleaned, as might result where brooms, dusters and wire brushes are employed.

The air jet is much more effective, especially for cleaning out-of-the-way corners. As a matter of fact, there are a great many places which the air jet will clean that are accessible to no other cleaning agency.

Many engineers will recall, and are perhaps even today using, the hand bellows for cleaning purposes, and if they are, can readily gain some idea of the adaptability of compressed air for cleaning, even though the bellows is at best a clumsy device.

Overhead apparatus, such as pulleys, shafting, pipes, wires and beams, are readily cleaned by mounting the cleaning nozzle on the end of a pipe through which the air passes. This not only saves time, but makes for safety of the operator. It eliminates the use of ladders and scaffolds.

Such machinery as electrical motors and generators re-

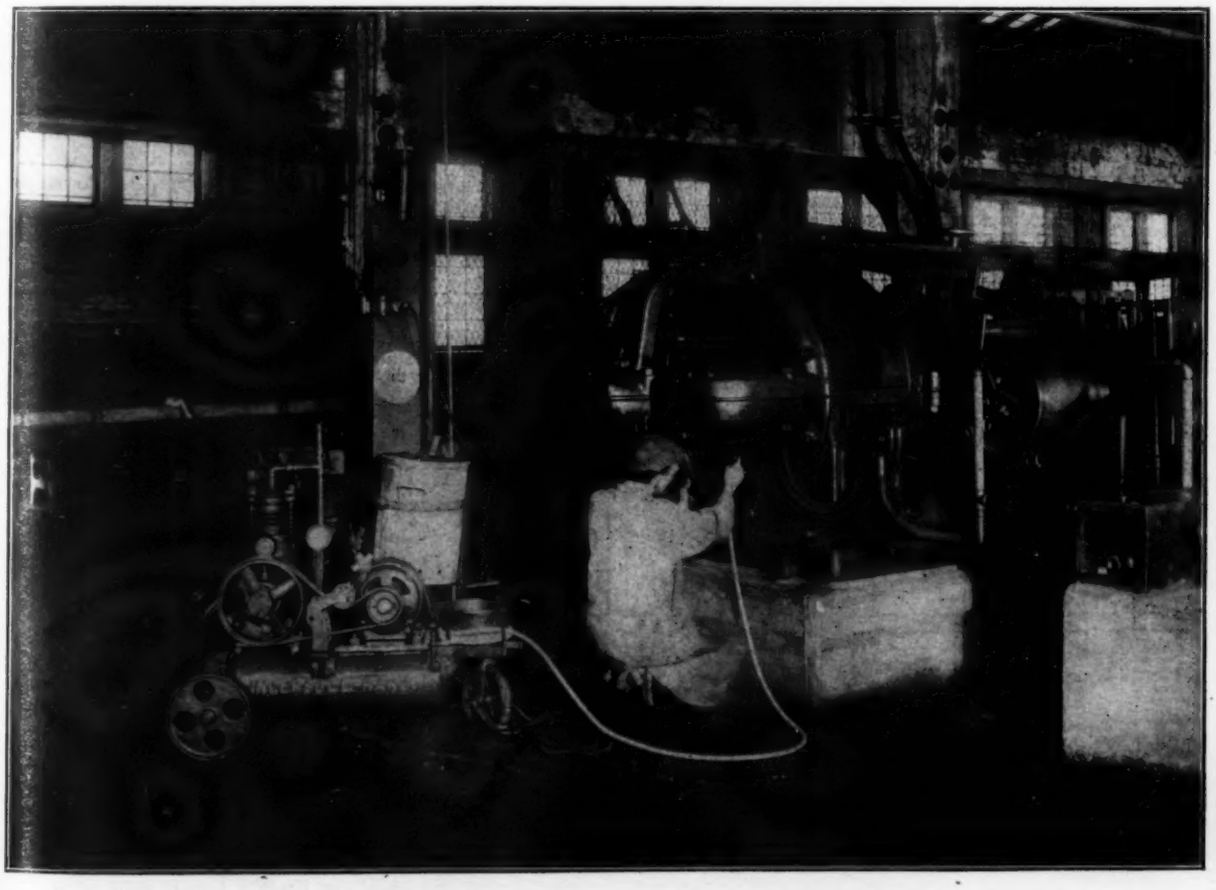


Fig. 1.—Portable Compressor Plant for Cleaning Electrical Machinery.

quire frequent cleaning to prevent dust, lint or other foreign substances from settling upon the rotor, field and other parts. This is especially true of the air spaces, as otherwise the temperature of the motor would tend to rise greatly, affecting the efficiency and perhaps even endangering the insulation by overheating. Fig. 1 shows such an application, using a portable compressor.

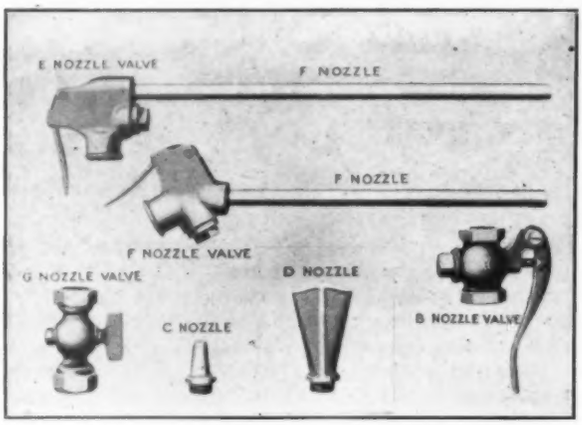


Fig. 2.—Various Types of Blowing Nozzles.

Scale, dirt and carbon deposit is quickly removed from gas-engine cylinders and valves by blowing them out with air.

For cleaning the flues of boilers of soot and dirt, compressed air is almost a necessity. Steam may be used for the purpose, but if compressed air around 80 pounds to 100 pounds pressure is available, it is decidedly preferable.

In the preparation of surfaces for painting, varnishing or lacquering, the air jet will be found a time saver and a thorough cleaning agent.

One of the most pronounced advantages of the compressed-air cleaning agent is its ability to dislodge dirt and dust while the machinery is running. This makes for economy.

Cleaning Nozzles.

The apparatus used may be a home-made affair, consisting of a length of garden hose with a plug cock on the end. The objection to the use of such crude devices is the fact that it is extravagantly expensive in that it wastes more air than is usefully applied. The many practicable and inexpensive cleaning nozzles on the market make it advisable to discourage the use of home-made apparatus. One type of air-cleaning nozzle commonly employed is self-closing when pressure is on the line. To use it, it is merely necessary to depress the button with the thumb, a greater or less force of blast being obtained by the degree of pressure applied to the button. Releasing the pressure on the button shuts off the air. This feature insures the consumption of air only when actually needed. The nozzle is supplied with a removable tip, making it possible to use any one of several varieties to meet various conditions.

In Fig. 2 are shown various types of blowing nozzles of the self-closing type, manufactured by the Westinghouse Air Brake Company. These nozzles are manufactured in sizes as follows: 1/16, 3/32, ⅛, and 3/16 inch circular.

The approximate air consumption of the various Westinghouse nozzles at various pressures are given in the accompanying table.

Air Pressure at Nozzle.	Cubic Feet of Free Air per Minute					
	1/16" Circular Drilled.	3/32" Stand'rd Circular.	3/32" for Cotton Mills.	⅛" Stand'rd Circular.	3/16" Circular Drilled.	3/16" Circular Cored.
20	2.4	4.5	4.5	8.1	10.7	14.2
35	3.5	6.6	6.5	11.2	17.1	20.9
50	4.5	9.0	8.7	14.7	22.8	28.3
60	5.2	10.5	10.2	17.0	26.4	33.0
75	6.3	12.7	12.2	20.5	32.2	40.5
85	7.0	14.3	13.8	22.8	35.8	45.0
100	8.0	16.8	16.2	26.5	41.5	51.6

For cleaning in inaccessible places, for instance, engine ports, valve passages or cylinder jackets, it is a good plan to attach a short length of flexible copper tubing to the end of the gun. This tubing may be bent into any desired shape. At any time where there is danger of injury by contact with the metal of the nozzle, a short piece of rubber tubing may be slipped over the end of the nozzle.

Various air pressures are employed for cleaning with the air jet. Those most common range from 10 to 35 pounds for light cleaning to from 60 to 100 pounds for heavy work. The amount of pressure employed with these nozzles may be readily controlled by the operator. A great deal of air is not necessary, and judgment should be exercised in this regard, bearing in mind that it is the sharp impact of the air which accomplishes the cleaning.

In general, the following instructions may be followed to advantage. It is advisable to start at the top and work downwards, avoiding going over any part of the work a second time. Care should be exercised in how the nozzle is manipulated, otherwise the dirt will merely be removed from one point and lodged at some other. In working around bearings, care should be taken to avoid blowing out lubricant. The cure

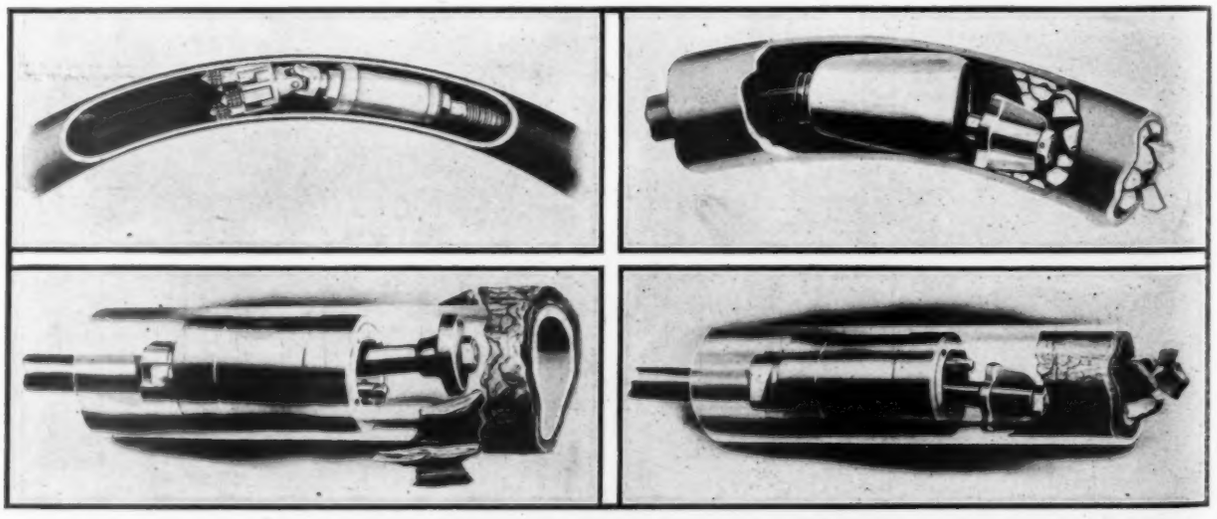


Fig. 3.—Several Types of Nozzles for Cleaning Boiler Tubes.

for this will most generally be found in the use of lower air pressure.

As cleaning hose has to withstand considerable wear, it is advisable to select a hose of good quality. Three-eighths

Fig. 4.—Rolling Boiler Flues with Pneumatic Drill.

inch hose will be found amply large enough for most cleaning purposes, and is also a size easy to handle.

Where a great deal of machinery is installed, it may be found advisable to install a permanent air line provided with conveniently spaced outlets. The use of quick detachable hose couplings will be found convenient and time saving.

Where a permanent air-compressor installation is out of the question, a portable equipment, such as that shown in Fig. 1, will be found comparatively inexpensive, and yet suitable for all cleaning needs. It is electrically operated; plugging the electric connection into a convenient wall socket puts it in condition for instant use.

Cleaning Boiler Tubes.

Boiler flues may be kept free of soot and dirt by blowing them out with compressed air. A pipe connected by hose with the air line is run back and forth in the tube, the air being given a whirling motion by the use of special nozzles. This motion has been found most effective in cutting out the dirt. The frequent use of the air jet for cleaning tubes will be found to result in more steam or less coal burnt, surely a desirable accomplishment.

For removing scale from boilers, air-operated cleaners are available. The work is accomplished rapidly and efficiently. A few such cleaners are shown in Fig. 3. These cleaners operate on two general principles. Some employ a reamer-like head, while others have toothed rollers, which press against and cut the scale, due to the centrifugal effect of the rotating head. Others are of the vibrator type, operating to break the scale by a rapid succession of light hammer blows. This type of cleaner is also applicable for removing scale deposited on the outside of fire tubes. Some of these cleaners employ the principle of the rotary engine, while others employ the reciprocating principle. Water is generally run into the tubes to wash out the cuttings.

In some plants the incrustation of foreign substances is removed by rapping the pipe with a hammer. This is dangerous and expensive. Pipes are apt to be cracked and joints started, while the inequality of the blow only partially removes the scale. The pneumatic scaler on the other hand operates quickly and uniformly, and this light uniform blow exercises no harmful effect on the boiler or condenser.

Repairing.

The private power plant has access to many of the pneumatic tools employed in the shop. These tools can be advantageously applied to making many of the power plant repairs. For instance, in making boiler repairs a section of plate can be cut out quickly by means of a chipping hammer, holes drilled in the shell to take the patch by a pneumatic drill and the joints riveted together quickly with pneumatic riveters the patch being finally calked by the substitution of the proper tool in the chipping hammer. In like manner, any of these tools may be employed in making all sorts of tank repairs and in construction work to be treated of later.

Pneumatic drills are frequently used in the power plant for rolling boiler flues, as illustrated in Fig. 4, for expanding the ends of new boiler tubes and flues, for drilling metal, reaming, tapping, wood boring and running in studs and bolts.

Hoisting and Conveying.

Compressed air can be conveniently used in the power plant for hoisting machines onto and off foundations, lifting out parts when making repairs or overhauling, conveying ashes, powdered coal, fuel, etc.

For the work of hoisting, there are a number of pneumatic hoists on the market which are reliable, easy to operate and quick in action. Fig. 5 shows a horizontal cylinder hoist applied to conveying ashes.

In some power plants, a central lubricating system is employed, the oil flowing by gravity to a central filter where it is purified and automatically forced by compressed air to a centrally located clean oil reservoir. From this reservoir,

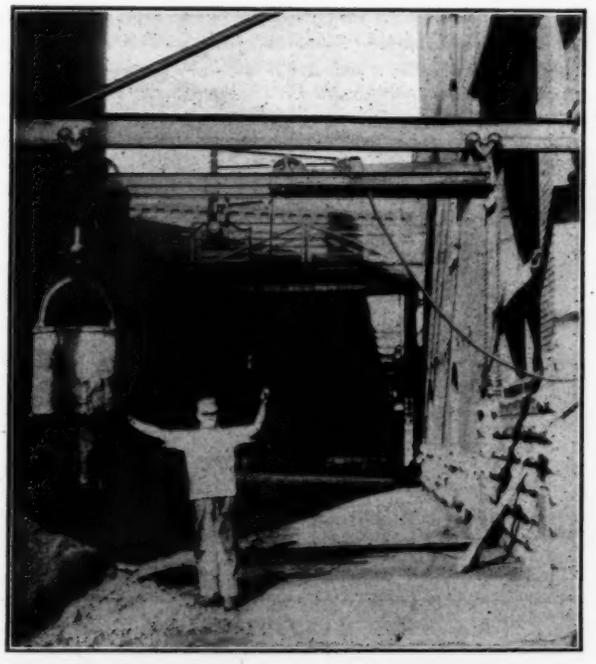


Fig. 5.—Removing Ashes by Means of Pneumatic Hoist.

the oil again flows by gravity to the various machinery in the plant.

For conveying bulk materials, such as ashes, powdered coal and similar material, there are two distinct systems employed—the pressure system and the suction system. In the pressure system low-pressure air is utilized, two pounds being

ordinarily sufficient, although as much as seven pounds pressure has been employed. A low-pressure blower of a type suitable for this class of work is shown in Fig. 6. Experience has shown that it is not advisable to apply this system to boiler plants of less than 1000 horsepower.

In action, the suction system operates as follows: The ashes are taken from the boiler dry, drawn into a storage tank, where they are automatically quenched and the dust settled.

For convenient handling, it is usual to install the ash-storage hoppers underneath the boilers. The hoppers are provided with gates, from which the ashes feed through intake hoppers, the rate of feeding being under the control of the attendant. From these intake hoppers the air current conveys the ashes through steel or cast-iron pipes to the storage tank, already referred to.

The exhauster is employed to draw the air from the storage tank, creating a sufficient vacuum to cause an inrush of air through the conveying pipe line, and it is this current that carries the ashes to the storage tank. The pipe line is provided with special elbows to break up the clinkers, so as to avoid obstruction in the conveying line.

The air taken from the storage tank is passed through an air scrubber, all dust and grit being removed from the air before it reaches the exhauster.

With the pressure system, the material to be conveyed is discharged into a large hopper, from which it is discharged into a power-driven feeder, which in turn feeds the material into the conveying line. The air current carries the material into a receiving tank, and in the case of coal this tank is usually located above the coal bunkers. It is discharged from this tank either directly into the bunkers or into a traveling hopper, enabling the distribution of the coal over a large area. A dust collector is a part of the system, collecting the dust which escapes from the separating tank.

A great many steam power plants are equipped with boiler furnaces for burning oil as fuel, the oil being fed to the furnace in an atomized state by means of compressed air. There are two systems employed, one known as low pressure, in which the air is supplied by a fan or blower, and the other

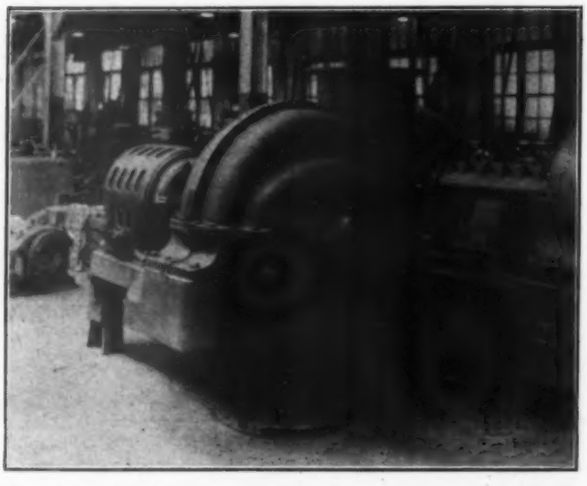


Fig. 6.—Motor-Driven Low-Pressure Blower for Blowing Furnaces.

high pressure, the air being supplied by an air compressor, a different nozzle being employed with each system.

Pumping.

For the private water-pumping plant where the water must come from deep wells, the air-lift system of pumping possesses many advantages. Perhaps the most pronounced advantage is its freedom from trouble. The system eliminates moving apparatus in the well itself, and places the control of the pumping in the power house where it belongs, under the immediate supervision of the engineer. Other systems, as for instance deep-well pumps, require as many pumping stations as there are wells, thereby multiplying the supervision. With

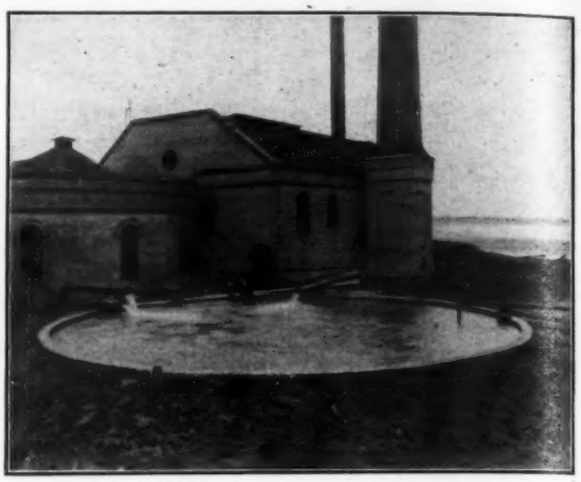


Fig. 7.—Power Station at Pine Bluff Showing Air Lifts Discharging Into Reservoir.

the air-lift system any number of wells may be pumped from one centrally located air compressor, as already stated.

In economy, the system compares favorably with that of other methods, while the degree of reliability assured is so much greater than that of other systems, that even though the system were more expensive to operate it would justify its preferance.

In Figs. 7 and 8 are shown several typical power-plant air-lift installations.

Compressed air is sometimes temporarily employed for operating reciprocating pumps, although it is not as economical as steam operation. This is so marked that except for emergency purposes it is not advisable to employ air.

Compressed air may also be used for emptying oil tank cars, raising liquid fuel, discharging contents of barrels, etc. In emptying the contents of a tank car or barrel, the contents are forced out by the pressure.

Painting.

Compressed air will be found an admirable agency for painting or whitewashing walls, beams, girders, etc. It has the advantage of lower cost and is decidedly more rapid than hand work. The paint, or other covering material, is sprayed onto the object. The apparatus used may be that consisting merely of a gun or a more elaborate outfit known as an air-brush.

Spraying the coating produces a more thorough and uniform job. The coating is projected on the surface with sufficient force to insure its entry into small cracks or crevices, ordinarily left untouched by the hand-painting process. In spraying, the object is to apply a fog-like spray of the coating until the fine heads of liquid coalesce and evenly cover the surface. It is a well known fact that three thin coats are better and more desirable than two thick ones, even if the total amount of coating used in each case is the same. With the spraying process the exact gauging of the thickness of the coating can be controlled, insuring best results and the minimum consumption of material.

Construction Work.

Quite frequently it occurs around the power plant that old concrete masonry foundations must be altered or entirely removed. In the case of masonry, it is a comparatively simple

task to break it up by hand. Concrete construction on the other hand presents considerable difficulty. The structure must be drilled and wedged out. The use of blasting powder is not to be thought of, as injury is apt to result to machinery placed in close proximity.

Anyone who has ever tried to drill concrete by hand can readily appreciate the labor involved. Compressed-air operated devices lend themselves very nicely to this work. The

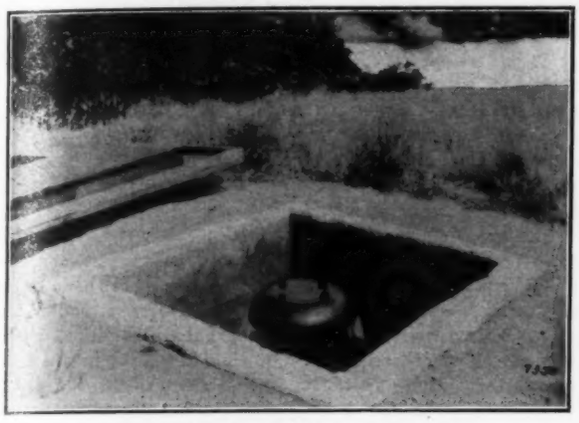


Fig. 8.—An Air-Lift Head and Well.

time for doing the work is considerably reduced and money is saved. For this type of work a small pneumatic hand rock drill, or if already available, a heavy riveting hammer may be employed. The methods to be pursued are similar to those employed in rock drilling, the only special equipment being required is two or three lengths of drill steel, properly sharpened.

An illustration of the adaptability of compressed air for this service will be found in the experience of the Philadelphia Electric Company of Philadelphia. This company found it necessary to remove a large machine foundation, in order to install a machine of a totally different character from that previously occupying the space. Expensive and delicate machines surrounded the foundation on all sides, necessitating the exercise of the greatest care in removing the old foundation. A small rock drill was used, and holes were quickly drilled at close enough intervals to enable breaking the concrete structure by means of wedges driven in the holes. The foundation was quickly removed without in any way disturbing the surrounding machines.

Likewise these drills may be used for drilling holes in concrete structures, for instance, for anchor bolt holes where it is desired to suspend some special structure.

Quite often additions are to be made to the power house, and in such cases the pneumatic riveters and drills will be found both convenient and time saving tools.

A study of this subject by the power-plant engineer will soon convince him that there is a wide variety of uses for this ever-ready power, not only simplifying a great many of his problems, but generally eliminating the laborious part of the work.

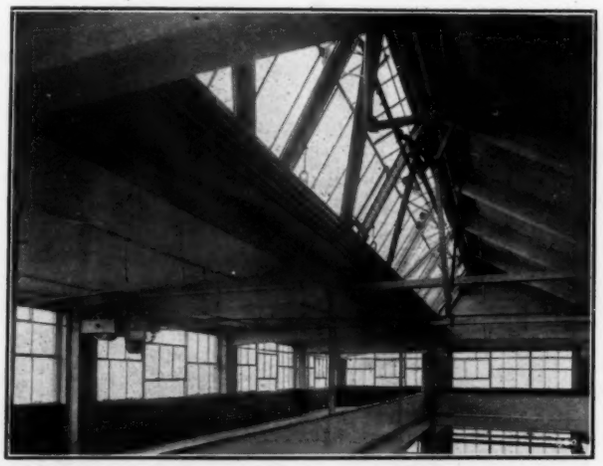
Electrically Operated Window Sash Proves Effective in Large Industrial Plant.

The accompanying illustration shows a unique electrically operated window sash installed at the plant of the B. F. Goodrich Company at Akron, O., where the ventilation is perfectly controlled, with resultant comfort and efficiency of the operatives. The steel sash is of the counterbalanced type in the side walls, and continuous sash with electric operating device in the sawtooth roofs. The continuous sash is installed in 14 sawtooth lines, each 70 feet long, simultaneously controlled by the operating device from one motor and three sawtooth lines, each 140 feet long, are operated together in a similar manner. Counterweights balance the sash load and reduce the work of the motor.

The electric operating device is particularly desirable where many sash are to be operated quickly, as in a foundry to prevent loss of heat after pouring, or to shut out sudden storms when pivoted sash are used. The motor drives through compound ball-bearing steel worm gears immersed in oil. An automatic cutout is used which limits the movement of the sash in each direction without strain on the operating device. It is arranged to open the circuit quickly to prevent arcing, although the chain itself moves slowly. The switch may be set to hold the sash at any degree of opening.

This electric device is designed to operate effectively long or short lines of top-hung, horizontally or vertically pivoted, and horizontally sliding sash. Power is transmitted through arms designed to give maximum leverage when the sash load is greatest. This load varies according to the type of sash. In pivoted sash the load is greatest at the moment of opening, when the sash are in contact at all sides with the frames, and is least at the widest degree of opening, when the upper part of the sash swinging in counterbalances the lower part swinging out. In top-hung sash the load must be lifted by the device and greatly increases as the angle of sash opening becomes wider.

The equipment provides various types of arms and operating gears which best meet the conditions, but the principle of operation, that of tension transmission of power and its application to the sash by correctly compounded levers, together with steel gears running in oil, phosphor-bronze bushings in all hinged connections and every other effort to secure the elimination of friction, are found in all the operating devices. The worm gear locks the sash in any position, preventing slamming and breakage of glass. The tension-transmission lines consist of steel rods in 20-foot lengths connected by malleable barrel couplings. The two lines are joined by a link chain over the idler pulley and a sprocket chain at the gear. The chain is provided with two stop bars, one at each end; one is brought in contact with the gear case when the sash are fully opened and the other when they are closed; they act as brakes, preventing any damage due to continued operation of the hand chain. The counterweight is hung on a steel cable, which passes over the spiral. The spiral



Electrically Operated Window-Sash for Sawtooth Roofs.

is so designed that its changing radius as the sash open and close, increases or decreases the leverage of the counterweight in exact proportion to the varying sash load, so that this load is always balanced in either direction. The counterweight is provided with slides and an automatic safety device.

Notable Conduit Installation Made In Toronto In Record Time

A 24-Duct Line 13,400 Feet Long Laid Through Downtown Section in Two Months—Many Difficulties Encountered

A CONTRACT recently awarded to the Toronto Hydro-Electric System by the Imperial Munition Board of Canada for supplying electrical energy to a new munition plant under course of construction at Ashbridges Bay, Toronto, necessitated the building of a conduit line several miles in length through the downtown section of Toronto. This is probably a record for conduit construction, as the average exceed the placing of 10,000 duct feet per day, or approximately 500 feet of trench excavation, conduits installed and trenches refilled. This is all the more remarkable when it is considered that work was commenced when there was considerable frost still on the ground.

The contract for the construction of this line was given to G. M. Gest, Ltd., of Montreal, contracting conduit engineers, the latter part of February which called for the completion of the work on or before May 1, 1917, ready for the installation of cables.

Details of Construction.

The work consisted of building a 24-duct line 13,400 feet in length and 55 brick manholes of the two-way, three-way and four-way types with 8-inch and 12-inch walls.

Four-inch fiber conduit was used with a three-inch envelope of concrete and 1.25-inch duct spacing. A 30-inch cover to the street grade was required. About 5,000 feet of the total distance of the line was laid under granite and asphalt pavement, while the remainder of the line, about 8,400 feet, went into sidewalks and boulevards.

The new conduits are on King Street, between John Street and Spadina Avenue, and on Wellington, from Strachan Avenue to Bay Street, and Jarvis Street to Cherry Street. The accompanying illustrations show the installation under way. The ducts are placed in six layers of four ducts each, each duct being separated by 1.5 inches of 1:2:4 concrete. One of the illustrations show the combs used to properly space the conduit and to serve as guides for the depth of concrete covering each horizontal layer. In the manufacture of the concrete good sand was not available, so fine crushed stone dust was used for this purpose, with highly satisfactory results.

Unusual obstacles were met with in this work from other underground installations. For example, at one corner—John and Wellington Streets—four manholes had to be constructed, owing to the large amount of obstruction met with. This corner is shown in one of the illustrations where two manholes are seen—one showing the ducts in a 4 by 6 arrangement; the other in a 6 by 4 arrangement, the difference in grade indicating the height of the obstacle that had to be overcome. At different times is was necessary to make considerable offsets, which were frequently accomplished by varying the shape of manhole.

Brick manholes were built throughout, as being more easily and safely constructed at the time of year this work was undertaken.

During the greater part of the time that this line was being constructed from 2 to 5 feet of frost was encountered in all excavations. It was especially bad under the paved streets, making it necessary to burn bonfires day and night to draw the frost from the ground.

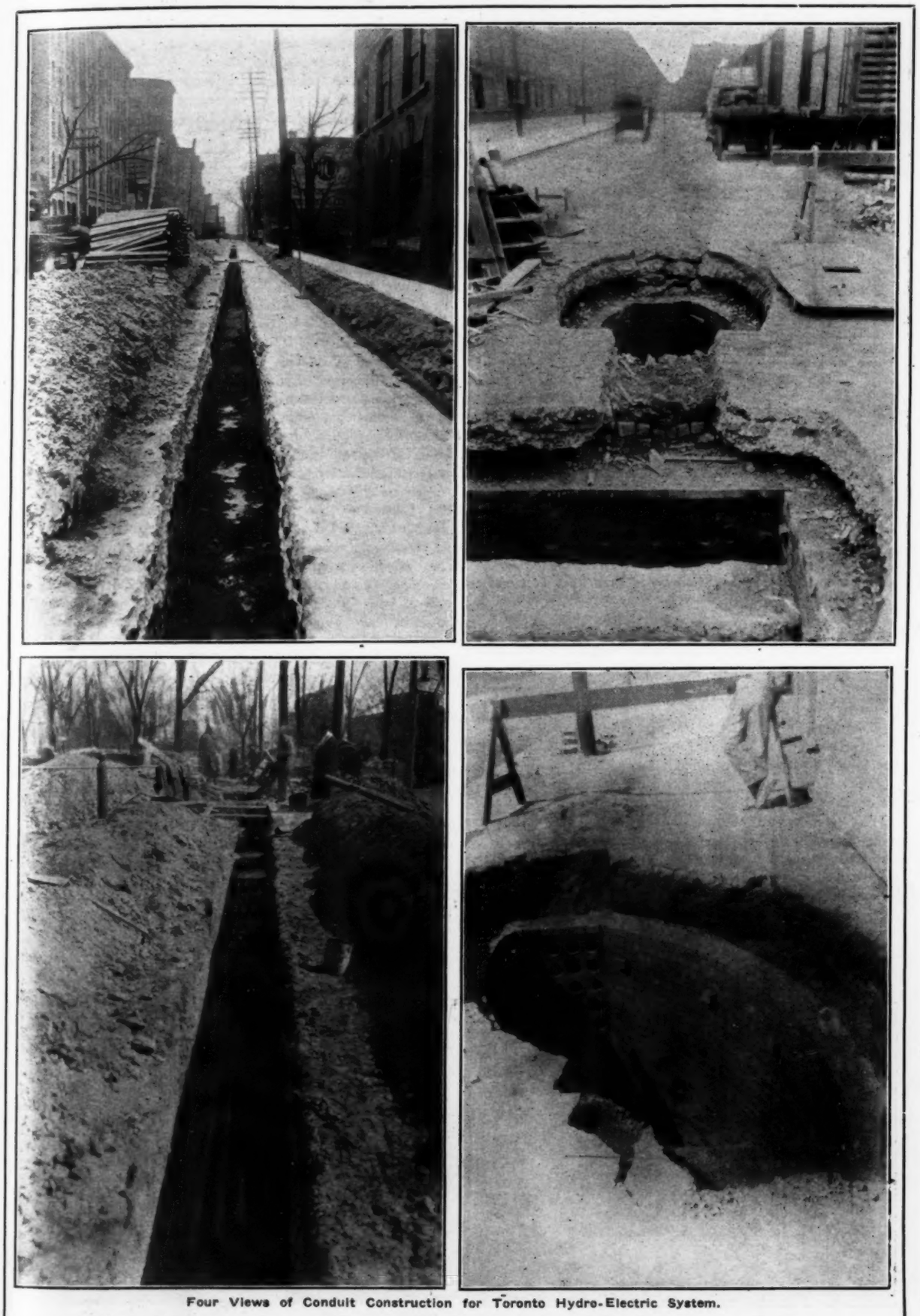
With only a limited time to complete the work it was necessary to have a constant supply of fiber pipe and to meet this condition the conduit company agreed to furnish and ship a carload on the average of every other day.

As freight congestion was bad at this time on the various railroads it was necessary to station men along the line to trace and to look after rushing all shipments through to

View Showing Protecting Plugs in Ends of Conduit.

Standard Oval Manhole With 24-Duct Entrance.

Separators Were Used to Obtain Even Spacing of Conduit.



Four Views of Conduit Construction for Toronto Hydro-Electric System.

Conduit Being Laid When There Was Five Feet of Frost in Ground.

destination. This was accomplished with very good results.

The work was divided into three sections, each section having a general foreman with foreman under him. The number of men on this entire organization amounting to several hundred men.

Frequently as high as 20,000 feet of conduit was laid by the three sections in one day, one section alone often laying over 11,000 feet which included all concreting.

Two sections were completed the latter part of April and on May 1 the last section was finished.

For over a week during the course of the work, pipe laying was held up because of lack of concrete material, this tieup being caused first by labor conditions at the quarries and then local freight embargoes caused by congested sidings, etc.

This trouble was finally overcome by drawing from a supply of stone stored at Hamilton which was shipped to Toronto and placed on private sidings, numerous times special engines being used to rush shipments to the sidings.

The contractor also did the rodding, averaging 26,000 feet per day with only a small organization on same, which is testimony of the careful work done.

With the severe winter weather which was encountered in executing the job and the low cost of the entire work, it was considered a remarkable record of good, co-operative and efficient work on the part of the both hydro system and the contractor's organization.

Marking Fruits by Electrical Device.

The branding of oranges and other citrus fruits of California, Texas and Florida with trade names by means of an electrical device promises to become a general practice. The patent of the machine is owned by the Electric Fruit Marking Company of San Francisco, Cal. It is stated that although the device has been used experimentally up to this time it gives entire satisfaction and promises to be widely introduced among citrus-fruit growers.

An electric iron is used to brand the orange. There is a big wheel filled with spokes. At the end of each spoke is a branding iron, or die, bearing the word to be used. The dies are automatically heated by electricity. The heat rises until it reaches a certain temperature, and then a thermostat arrangement shuts off the heat and reduces the temperature, so it is impossible to burn the skin of the fruit, and at the same time the iron will not become too cool to perform its function.

Each spoke in the wheel slides in a chamber which is regulated by a light spring. As the wheel turns and the foot of the spoke presses the die down upon the cheek of an orange, the length of the spoke diminishes to adjust the pressure of the die to the size of the orange. The spoke slides back into its chamber and in that way the machine automatically avoids putting on enough pressure to cut the skin of the fruit with the die.

The brand is obtained by inking the die upon a ribbon at the top of the machine as the wheel revolves, and then pressing it against the orange. The heat of the die melts the wax in the skin of the orange, causes it to flow into the little furrows made by the lines in the die, and then deposits the gummy indelible ink from the face of the die upon the wax in the imprint. In that manner the black or blue brand is imbedded in the cheek of the orange, and nobody can remove it.

There are eighteen spokes in each machine wheel, giving the device a capacity of a dozen and a half brands at each revolution. The wheel travels at the rate of 20 revolutions per minute and brands 360 oranges in that time. At the rate of two boxes of oranges per minute the machine can turn out a carload of branded oranges every four hours, or about two carloads a day, counting stops. At that rate each packing-house in the exchange would need from three to four machines in order to brand its full packing capacity.

Manhole Built to Connect With Existing Line.

Finished Ducts Before Completion of Manhole.

Notes on Commercial Practice

New-Business Methods, Policies, Rates and Kindred Central Station Matters for the Man Engaged in Selling Electricity

Knoxville Company Makes Free Wiring Offer.

The Knoxville Electric Company of Knoxville, Tenn., is making a proposition to residents of that city for free wiring of three rooms of houses for which it gets the contract. This is done to stimulate business during the dull summer months.

Electric Taxicabs to Be Installed in St. Louis.

The most recent installation of electric taxicabs, which have met with phenomenal success in Detroit, is in St. Louis, where six cars make up the nucleus of a fleet. The clean, silent, smooth running attractive electric taxicab has made a strong and immediate appeal, and has proven itself to be extremely well fitted for this service, especially because of its low operating cost, and its simplicity of operation through congested streets, insuring safety to its occupants. The mileage of these "electrics" is practically unlimited, as facilities for curb "boosting" are situated in various parts of the city, so that the cab may be charged while it is waiting, even though it may be only a few minutes.

The Electric Vehicle Section, National Electric Light Association, is advised that an electric taxicab company is now being organized in Mexico City, and it is interesting to note that whereas the electric taxicab met its first success in Detroit, the home of the gasoline car, it is now to compete with the gas car in the habitat of hundreds of oil wells.

Aside from the generally appreciated virtues of the electric taxicab, it is cosmopolitan, for we also find it in successful operation in Shanghai, China, where it has to a great extent replaced the quaint and quite inexpensive jinrickisha.

Progress is being made in the matter of the initial fleet of about 500 electric taxicabs of the most advanced type, which it is intended to install in New York City, which will provide a service of a distinctly revolutionary character.

COMPARATIVE DATA ON COST OF OPERATING GAS AND ELECTRIC CARS.

Tests Made Under Various Conditions Show Electric Passenger Car More Economical in Every Case.

Herewith are presented some interesting data on comparisons in operating costs of a Detroit electric passenger vehicle and a gasoline automobile of about the same class and approximate valuation. These figures were based on average conditions.

TABLE I.—OPERATING COSTS WITH BOTH CARS KEPT IN PUBLIC GARAGE—BASED ON 10,000 MILES PER YEAR.

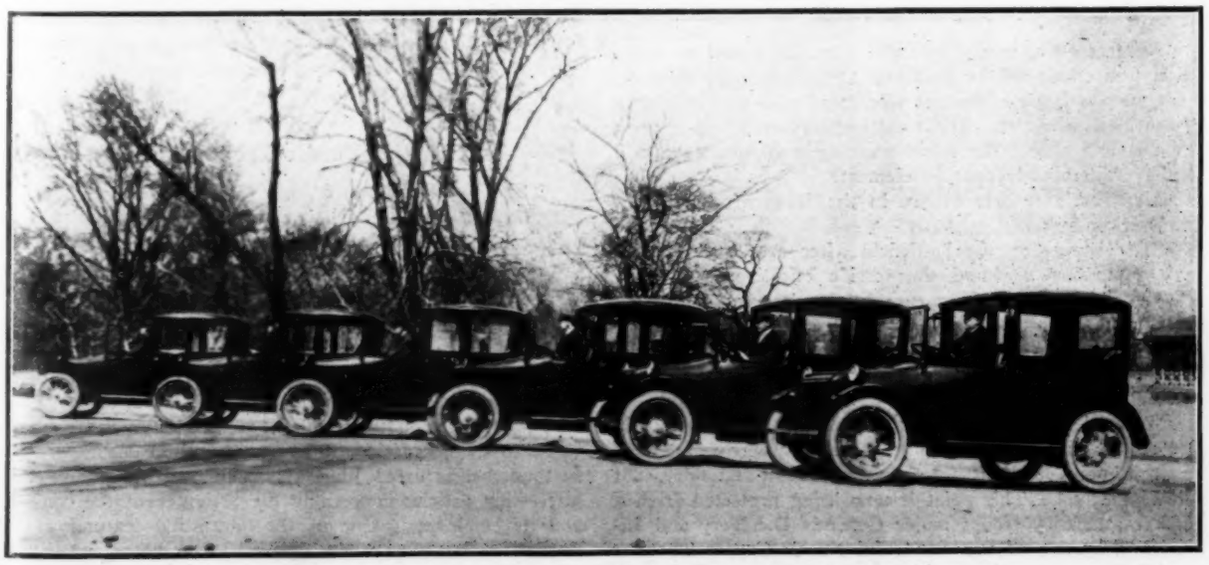
	Gas.	Electric.	Per Cent.
Insurance $2000	$150.00	$135.00	11
Tires	384.20	244.20	57
Paint	150.00	125.00	20
Garage	300.00	420.00	29*
Overhaul, etc.	350.00	75.00	366
Oil	20.00		
Gasoline	257.22		
Batteries and incidentals		266.66	
Total	$1611.40	$1265.86	28

*In favor of gasoline car.

While the actual garage costs under conditions shown in Table I, favor the gas car by 29 per cent, it must be remembered that the electric garage item covers charging, washing, polishing, cleaning of interior, deliveries and storage, while the gas covers only washing, polishing and storage.

When both cars are kept in a public garage, as shown in Table I, but with a chauffeur for the gasoline car the figures then compare as follows:

Gas.	Electric.	Per Cent.
$2811.40	$1265.86	122



Fleet of Electric Taxicabs for St. Louis.

This is based on a chauffeur's salary of $100 per month, other figures being the same as in Table I.

TABLE II.—OPERATING COSTS WHEN BOTH CARS ARE KEPT IN PRIVATE GARAGE AND GAS CAR RUN BY CHAUFFEUR.—BASED ON 10,000 MILES PER YEAR.

	Gas.	Electric.	Per Cent.
Insurance $2000	$150.00	$135.00	11
Tires	384.20	244.20	57
Paint	150.00	125.00	20
Overhaul, etc.	350.00	75.00	366
Oil	20.00		
Gasoline	257.22		
Batteries		266.67	
Electricity		183.33	62*
Chauffeur	1200.00		
Total	$2511.42	$1029.20	144

*In favor of gasoline car.

TABLE III.—OPERATING COSTS WHEN BOTH CARS ARE KEPT IN PRIVATE GARAGE.—BASED ON 5,000 MILES PER YEAR.

	Gas.	Electric.	Per Cent.
Insurance $2000	$150.00	$135.00	11
Tires	192.10	122.10	57
Paint	150.00	125.00	20
Overhaul, etc.	175.00	37.50	366
Oil	10.00		
Gasoline	128.56		
Batteries		133.33	62*
Electricity		91.67	
Total	$805.66	$644.60	25

*In favor of gasoline car.

Electricity is based on a flat rate of $0.055 per kilowatt-hour, and figuring three miles per kilowatt-hour.

TABLE IV.—OPERATING COSTS WHEN BOTH CARS ARE KEPT IN PRIVATE GARAGE.

	Gas.	Electric.	Per Cent.
Insurance $2000	$150.00	$135.00	11
Tires	96.05	61.05	57
Paint	75.00	60.00	25
Overhaul	100.00	30.00	233
Oil	10.20		
Gasoline	64.30		
Electricity		45.83	
Batteries and incidentals		187.50	178*
	$495.55	$419.38	18
With chauffeur	960.00		
	$1455.55	$419.38	247

Figures are based on 2500 miles per year. This covers the average small town user.

In the accompanying data insurance charges cover full insurance for both types of cars, although the recent advance of 20 per cent in gas-car rates has not been included. Tire costs are based on cord tires, 36 by 4½ for the gas car and 34 by 4½ for the electric. Gasoline is figured at 18 cents per gallon, allowing seven miles to the gallon. Electricity is figured at $0.05 per kilowatt-hour.

Washing Machines Sold to Chinese Laundries in Portland, Ore.

An interesting story of how a washing-machine campaign was conducted in Portland, Ore., is told by Fred C. Todt, of the Hurley Machine Company, who was in charge of the local campaign. The results are of particular interest when it is realized that many washing machines were sold to the Chinese and Japanese element.

Mr. Todt's report, written in the form of a war dispatch, is as follows:

"The scenes on the battlefield after the 'Thor' troops took possession disclosed the terrific effectiveness of our fire. Washboards had been entirely abandoned and in many cases were found wrecked on the wood piles or in the garbage cans, showing us that the enemy gave up in despair and panic when the full effects of our 'Thor' artillery were realized.

"One of the most gratifying results of our campaign in this section has been the capture of an extremely important strategic point in Chinatown, Kwong Mow Laundry, 231 Madison Street. This point is now being protected from a counter attack by troops under Generals Drudgery and Inefficiency, by one of our wonderful No. 28 Copper Thors.

"For two years this position has defied our well thought out plans and constant aggressive attacks. Our unfamiliarity with the language spoken by the subjects inhabiting the Chinese laundry section formed an obstacle that threatened to make all of our efforts futile.

"The Japanese positions captured amount to a dozen or more. These, with our modern 'Thor' artillery, have been comparatively easy to gain. We account for this by reminding you that the Japanese are better acquainted with modern domestic artillery. After short bombardments with our Thors they were quick to see the hopelessness of their positions. They are fast surrendering to the crack Thor regiments and we hope to completely eliminate old General Inefficiency with his feeble washboard artillery as soon as we can find time to devote attention to these points.

"In summing up the situation on the Portland front we report with much confidence that the drive against washday drudgery will net many new positions to our arms and ultimately result in reducing the number of positions held by Washday Drudgery to a number so small that their existence will be difficult to locate and will cause us but little concern."

Reduction in Rates Provokes Editorial Comment.

The favorable sentiment created by a voluntary reduction in electricity rates is well exemplified by an editorial published by the Yankton *Herald* in connection with the reduction in power rates put into effect by the Yankton (N. D.) Heat & Power Company.

The editorial is as follows:

It is with a great deal of pleasure that the Herald publishes in another column of this issue an announcement by the local Yankton Heat & Power Company, that, beginning with the first of July, its power rates for electric current will be greatly reduced. Cheap power is the most attractive thing a city can offer for average manufacturing industry and the very reasonable rates the local electric company is making for its product is an inducement for investment of capital in Yankton that cannot be overlooked. Rates are now such that many plants already in operation here will find it profitable to adopt the electric power and undoubtedly will do so. Enterprise such as that shown by the electric company should be properly appreciated by a commensurate increase of patronage, else its sacrifice will go unrewarded and stand as a warning why other local institutions should not follow its example. Speaking for one of the larger power users in the city, the Herald desires the Heat & Power Company to know that it appreciates what this reduction will mean to it in a business way, and, coming at a time when everything else in the printing business and almost all other kinds of business is steadily advancing in price, lends a color to the transaction of its own.

Flags on Toledo Trolley Ropes.

The Toledo Railways & Light Company fittingly observed Flag Day on June 14 by hanging a new American flag, four by two and one-half feet, on the trolley rope of every one of the 300 cars of the company. As the cars traveled along, with the flags waving in the breeze, much favorable comment was passed by the people on the streets.

New Central-Station House Organ Appears.—The Monongahela Valley Traction Company, Fairmont, W. Va., has started the issuance of a monthly house organ, devoted to the promotion of co-operation and efficiency. The first number is dated June, 1917, and contains a number of interesting articles concerning the activities of the company and its employees. One of the interesting features of the publication is a department devoted to the home and garden, containing useful hints for the amateur gardener.

Toledo Company Increases Wholesale Rates.

The rate schedule for wholesale lighting and power has just been revised by the Toledo (O.) Railways & Light Company, and will go into effect July 1. The revision in the schedule was approved by the state Commission, and in some cases made to conform to those of other power companies in the state. Different classifications of users of power will have different rates. The new schedule will not affect some manufacturers, but will mean an increase of more than eight per cent to others. The residence lighting rate will not be changed, remaining at the 7 cents per kilowatt-hour maximum. Fred Derge, vice-president of the company, says the increase was made necessary by the advanced price of coal and other material. He pointed out the fact that last year the concern was paying $1.85 per ton for steam coal, while this year the same coal is bought at $5.50. The employees at the power plants of the company have also been increased in numbers and a higher wage is being paid them than heretofore.

The new rates will affect about 5,000 manufacturers and other users of current for power and lighting on a large scale.

Sales Helps for Central Stations Offered by Society for Electrical Development.

In line with the aggressive activities of the Society for Electrical Development to build up better advertising and merchandising methods for its members, it issues a "Monthly Sales Service" containing copy suggestions, stories of successful campaigns to increase the use of appliances, etc.

The accompanying illustration shows three timely advertising suggestions which appeared in the July issue. Cuts shown in this copy, as in all advertising matter presented, are furnished by the Society.

The July issue, which is typical, contains a great deal of interesting matter for central-station companies and electrical dealers. The introduction is a part of the "Keep Business Moving" campaign urging the electrical man to make now his supreme efforts in his field of trade. Then follow eight pages of illustrated advertisements. These can be used by the local dealers, jobbers, central stations, either as newspaper advertisements or mailing cards, etc. This follows the plan of the Co-ordinate Advertising Committee of the N. E. L. A., featuring a certain article each month. On another page is an example of a sales letter which will be found effective in promoting the sale of washing machines, and two subsequent pages give concrete ideas on how to sell washing machines.

Each "Sales Service" is different from the other, and it is aimed to put into this Service only material that will interest all, or nearly all, of the electrical businesses, such as manufacturers, central stations, jobbers and dealers. Quite often there are articles on accounting methods, cost systems, etc.

Commercial Section Starting Sale of Christmas Booklet.—The Commercial Section of the National Electric Light Association, through its publication committee, has already started a campaign to bring the Section's Christmas booklet before central-station companies. Because of the high cost of paper and printing this year, it is expected that there will be an exceptional demand and consequently orders have been placed for an enormous edition, thereby insuring low prices to purchasers.

The booklet, samples of which are being distributed, is of very attractive appearance, printed in three colors, and typifies the Christmas spirit throughout. It comprises 16 pages and illustrates and describes some 25 different appliances which have been found most popular as gifts.

Doherty Organization Contributes $250,000 to Red Cross.—The directors of the Cities Service Company, at a meeting held at the office of Henry L. Doherty & Company on June 20, voted to create a fund of $250,000 to be given to the American Red Cross.

Don't—
please don't—
wear out yourself over a tub-and-a-board, when an Electric Washer will do it quicker and better.
It may be you, or it may be a hundred. No matter. it's your wash. And it's your home. And you are the one who suffers!
Save! Conserve! Economize! That's the slogan today. And if anything on earth will save women, it's the Electric Washer.
It has given many a housewife an entirely different view of life. Has made her "house" a home. Has lengthened her pleasures and recreations. Has given further opportunity to serve her family, do Red Cross work, and otherwise help Uncle Sam.
Just one week's trial convinces. And as to cost—OUR WASHER pays for itself
Ask us NOW!
(Your Name and Address)
Daintiness and Cleanliness...
She just returned home and, as easily as she slipped on her apron, prepared luncheon on her—
Electric Range
With a cool kitchen, clean utensils, a quick range, and certain results, her efforts were a grand success.
If you have never used an electric range you have yet to know real comfort and satisfaction in cooking.
Proofs? Certainly! Call for a free demonstration.
(Your Name and Address Here)
Spotlessly White—
and in Half the Time!
This is one way that women are simplifying their household tasks by employing the "electrical servant."
An electrically operated Washing Machine saves time, effort, laundress and clothes. It takes the "blue" out of Monday and leaves you free to perform other duties or enjoy pleasures.
Its use saves your clothes by doing away with washboard rubbing; solves the servant problem which is becoming acute through forced industry; reduces expenses all around during these days of retrenchment.
A free demonstration is convincing. Drop in today!
(Your Name and Address)

Three Suggestions for Timely Newspaper Advertisements for Central-Station Companies.

Electrical Construction Notes

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

Protecting Delta-Connected Transformers from Themselves.

By R. L. Montgomery.

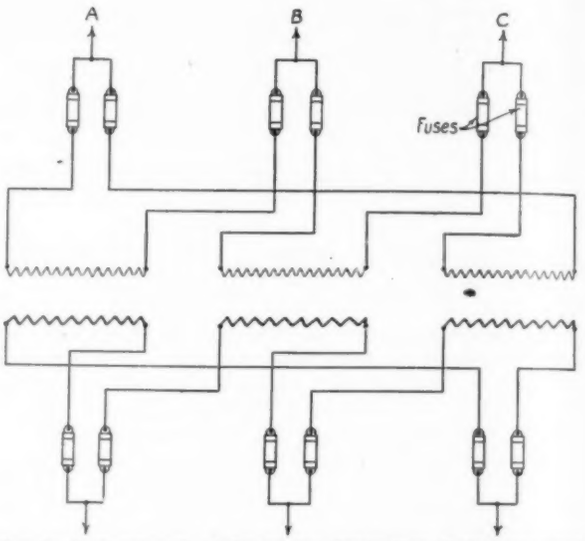
One of the greatest advantages of the delta-connected bank of transformers over the star-connected bank, and the one usually advanced, is that should one of the three transformers in a three-phase bank of single-phase transformers fail the other two are able to continue carrying the three-phase load without upsetting the three-phase system other than to cause a slight unbalance, the extent of which depends upon the magnitude of the load, its characteristics, and the relative capacity of the load, the transformers supplying it and the circuit supplying them.

When two single-phase transformers supply a three-phase load from a three-phase system, and these two transformers are connected in what is known as open delta or V, the three-phase capacity is $1/\sqrt{3}$ or 58 per cent of the capacity of three single-phase units when connected in closed delta, and the combined capacity of the two transformers is but 86.6 per cent of their single-phase capacity before, the loss of about 13.3 per cent being due to phase displacement between voltage and current due to the two transformers supplying the open phase.

When one unit out of the three units of the delta-connected group fails before the remaining two are able to carry the three-phase load, it is necessary that the defective transformer be disconnected from circuit, or at any rate from the circuit comprising the closed transformer bank. Usually when a transformer fails it causes a short circuit which immediately interrupts service automatically, the interruption persisting until the defective unit has been cleared. In any case it is only after the delay required for the defective transformer to burn itself or be cut clear of the circuit and the other two that the two remaining transformers are able to carry the three-phase load under conditions approaching a balanced system.

It must be obvious that the necessity of isolating the disabled transformer in a delta-connected bank is objectionable as ordinarily done. It takes time, and causes delay until energy can again be on the lines. Connecting in solidly three transformers in delta to a very large extent defeats the advantage of the connection, for the time being at least. It is not the fault of the connection, but the manner in which the three units are connected rigidly together. In some instances it is highly important that the three-phase supply should attain a high standard of continuity, and almost every chance within reason and at any cost as to damage to apparatus is taken rather than risk interruption to service.

For even these important applications the delta connection can be employed with its ability to furnish three-phase energy over two instead of three transformers, but without the loss of time incident to disconnecting any of the three units should it become disabled. This can be done by inserting fuses as shown in the accompanying sketch. It will be seen that both terminals of each primary and each secondary are in this way protected by independent fuses. Disconnecting switches may be used, of course, only then a small interval must elapse before the disabled unit is disconnected. If fuses are resorted to, the trouble will clear itself instantly, and leave the other two transformers to carry the load.



Simple Arrangement of Fuses for Protecting Delta-Connected Transformers.

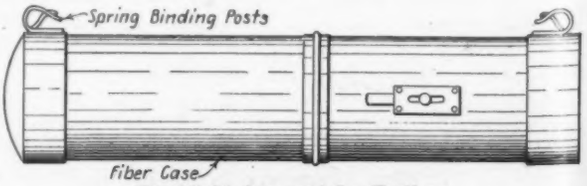
Using Flashlight as a Test Lamp.

By John J. Carl.

In the many cases where the electrician must resort to some simple test to prove the continuity of a circuit, locate both ends of a given wire, or in the many other problems that are continually coming up, I have found the little device which is illustrated herewith very useful. In cases where only a simple test is required, it is of course simple enough to provide a few dry cells and a bell or voltmeter.

An ordinary tubular flashlight with spring binding posts soldered to each end can be used effectively for such testing without destroying its normal function as a flashlight. I have used such a device for a long time and would not think of going on a job without it, for even though I may have no need for it to make a test, it is always ready to light up some dark corner, for this purpose being much safer than the use of matches or candles.

In making a test it is only necessary to attach the terminals of the circuit to the binding posts and the lamp in the flashlight will light up provided the circuit is complete. Of course any type of flashlight could be used, provided that the proper connections are made.



Flashlight Arranged for Testing.

Brush Spacing and Brush Thickness

Discussion of Commutation Troubles Caused by Improper Spacing of Brushes and Excessive or Deficient Brush Thickness—Tests for Determining the Cause of the Trouble and Remedies Therefor

By E. H. MARTINDALE

Chairman, Industrial and Domestic Power Committee, A. I. E. E.

This is the eighth of a series of 14 articles on the solution of commutator and brush troubles. The series began in the issue of March 24 and appears at intervals of two weeks. The earlier articles of the series were devoted to brush characteristics and a general discussion of commutation troubles followed by a detailed consideration of some of the principal troubles. In the present and remaining articles other troubles due to a variety of defects and their remedies are discussed.

THE accurate spacing of brushes around a commutator is one of the most important points in the proper operation of multipolar motors or generators and at the same time one of the most frequently neglected. Incorrect spacing may be due to unequal spacing of the brush studs, dissimilar assembly of holders on a round stud, dissimilar assembly of rectangular studs to which brush holders are bolted, or to unequal spacing of the field poles. The first three are mechanical and the last electrical.

Troubles Due to Incorrect Brush Spacing.

Incorrect spacing may cause very heavy short-circuit currents between brush studs of the same polarity through the connecting busbar or leads. The voltage behind this short-circuit current is low, being only the difference between the maximum and minimum commutator voltages under the incorrectly spaced brushes, but the current is high, which means a comparatively low power loss but an excessive heating of the commutator.

Fig. 1 shows a commutator on which the spacing of the brush studs is uniform, but in which the brush holder on stud *A* has been rotated too far from the commutator and on stud *C* too near the commutator. This throws one brush one bar ahead of neutral and the other one bar back of neutral. This difference of two bars is enough to cause a very heavy short-circuit current unless the neutral field on this machine is unusually wide.

To determine the extent of such short-circuit currents the writer conducted some tests on the generator shown in the foreground of Fig. 2. This is a General Electric type M P, six-pole, 600-revolution-per-minute, 100-kilowatt, 250-volt, 400-ampere generator. The busbar connecting the positive studs was carefully calibrated with a millivoltmeter to read the current passing through it. The brushes on one stud were moved three-fourths of the width of one bar (about ⅜ inch) ahead of correct spacing. The generator was operated at normal voltage and at no load with the line circuit-breakers open. At no load the electrical neutral point should coincide with the mechanical neutral point; that is, at a point half way between pole pieces. The neutral field on this machine was wide enough so that with this unequal spacing there was very little short-circuit current when the brushes were as near as possible to the neutral point. When the brushes were shifted two bars ahead of the neutral the short-circuit current rose to 800 amperes or twice the full-load current of the machine. All of this current came out of the incorrect stud and flowed back through the other two studs of the same polarity. The current density in the brushes on the incorrect stud was over 200 amperes per square inch and on the other two studs over 100 amperes per square inch. The brushes quickly became white hot, the sparking was intense, and the commutator was severely burned and pitted. This is an extreme example, but a much

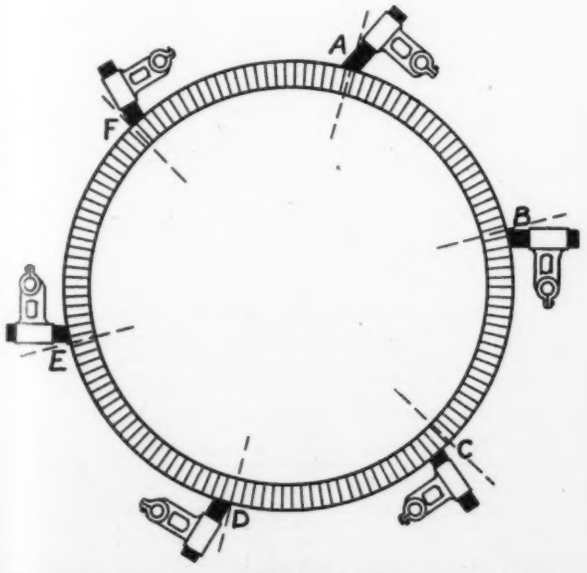


Fig. 1.—Diagram of Commutator Showing Incorrect Brush Spacings.

Fig. 2.—Generator Tested to Show Short-Circuit Currents Due to Incorrect Brush Spacings.

smaller variation may produce excessive sparking and such heating that full load cannot be maintained.

How to Equalize Brush Spacing.

For machines with a wide neutral field satisfactory spacing can be secured by counting the number of bars in the commutator, dividing by the number of brush studs and setting the brushes that distance apart. A better method, particularly for machines with a narrow neutral field, is to cut a strip of paper of a length to just equal the circumference of the commutator, mark off on this paper as many equal divisions as there are brush studs. Then place the paper around the commutator and set the brushes accurately to the marks.

If there is still some evidence of short-circuit currents between studs, the trouble is probably due to an inequality in the fields. First, see that the air gaps are uniform and that the field windings are correct. If these are correct the brushes should be set by a low-reading voltmeter. Cut two lead pencils down on one side until only a thin layer of wood protects the lead. Near the top of each pencil expose the lead to which attach the voltmeter leads, or flexible lamp cord. Remove one brush and hold the pencils in the brush holder with the points on the commutator and the flat side of one pencil against the back edge of the holder and the flat side of the other pencil against the front edge of the holder. This will show the voltage generated across the brush, which is generally called the "commutation voltage." This operation should be repeated for one holder on each brush stud and the holders adjusted so that the voltage measured by the above method is the same, except that on the positive studs the direction of the commutation voltage should be in the opposite direction from that on the negative studs.

Thickness of Brush and Its Effect on Commutation.

The thickness of a brush has an important bearing on commutation. In a direct-current commutating machine the direction of the current in a coil must reverse while the commutator bars connected to that coil are passing under the brush, or, in the usual terms, while the coil is short-circuited by the brush. In a perfectly designed machine the coil undergoing commutation is in a field just strong enough to reduce the current in the coil to zero and build it up to full value in the opposite direction. If the current does not reverse and build to full value the coil is said to undercommutate, while if the reverse current builds up too high the coil is said to overcommutate. In either case sparking may result and in overcommutation it may become very severe, burning and pitting both the brushes and the commutator. The best way to determine whether the trouble is under or overcommutation is to measure the voltage on the commutator across the brush with two lead pencils as explained above. This voltage should be read with the machine operating at any load at the point where there is the least sparking. The load should then be increased until the sparking is noticeably worse and the commutation voltage again read. If this voltage has decreased the brushes are too narrow, that is, the period of commutation is too brief. The remedy is to use thicker brushes or to shift the brushes with each change of load. Undercommutation is seldom severe enough to cause any sparking and the chances are a hundred to one that with the increased sparking the commutation voltage has increased, showing overcommutation.

Remedies for Overcommutation.

There are three common cures for overcommutation. The first is to trim down the end of the brush for a short distance back from the commutator, or, if the holders are of the clamp type, to use a thinner brush. Second, to use brushes with higher contact drop. Third, to widen the neutral field by filing away the edges of the pole pieces.

The first method has been extensively used and where brushes are pitted or honeycombed we would recommend that this be tried. A one-inch thick brush can be trimmed down to three-fourths inch thick and corresponding reductions be made on other brushes. This apparently increases the current density in the brushes but actually greatly reduces the current because of the elimination of the excess short-circuit current. Most carbon and graphite brushes are rated by manufacturers with carrying capacities of from 25 to 70 amperes per square inch, which takes into account average commutation conditions. If all short-circuit currents are eliminated the brushes will operate perfectly at from 50 per cent more current in highly rated brushes to 100 per cent or even 150 per cent more current in lowly rated brushes than shown by the manufacturers. Practically every case of pitting or honeycombing of brush faces on direct-current machines is due to either low brush pressure or short-circuit currents under the brush faces. The second cure of using brushes with high contact drop is effective where the tendency to overcommutate is not too severe. The resistance of the short-circuited coil is very low and as the current in the short-circuited path must pass through the brush contact twice it can readily be seen that an increase in the contact resistance will make almost a corresponding decrease in the short-circuit currents. The third method of trimming the pole pieces may slightly increase the speed of a motor or decrease the voltage of a generator, but can be relied on as a permanent cure.

To Preserve Tools from Rust.—When electrical workers are engaged in the installation of conduit work in modern buildings in course of erection, especially reinforced-concrete structures, they are bothered in the handling of rusty tools due to the lack of a dry place to store tool boxes. A good way to prevent rusty tools on modern building construction or outside line work is as follows: Buy a 10-cent jar of petroleum jelly or yellow petroleum in a hardware store or, if not obtainable there, buy the cheapest possible grade in a drug store. With it grease each tool well. This method will fully protect the tool from rust for a long time. The greased tool can be wiped clean with cotton waste. M. J. Moriarty.

Among the Contractors.

The United Electric Construction Company, 1727 Sansome Street, Philadelphia, Pa., has been awarded a contract for electrical equipment to be installed in a new building at the League Island Navy Yard.

The Kingsbury-Samuels Electric Company, 213 North Calvert Street, Baltimore, Md., has received a contract for electrical work in the new office building to be erected at 110-112 East Lexington Street; also, a contract for electric wiring and equipment for a new warehouse building at 212 West Fayette Street.

The Oglesby Construction Company, which has a contract for much levee construction on the Missouri bank of the Mississippi River, opposite Hickman, Ky., has installed an isolated electric lighting plant and will continue work during the nights.

Bates & Rogers, Chicago, were awarded the contract for building the $5,000,000 army cantonment at Rockford, Ill. Work on the city will begin at once, when the first of the troops will arrive. The contract included provisions for the laying of city streets, installation of heating, lighting, sewage and water systems, and the building of fourteen miles of railway tracks.

USEFUL WIRING HINTS

A collection of some short-cut or otherwise valuable suggestions which, though not entirely new, are not as well known by wiremen as they deserve to be. Most of these suggestions have been submitted for publication as "Dollar Wiring Kinks," which department is intended for new and original ideas only and will reappear soon.

Fishing Wire Through Conduit.—I find that a very good way to fish wire through conduit is to take a high-pressure tank (commonly used by nearly all gas companies to locate leaks) and pump it full of air. Then take a cork small enough to glide easily through the conduit and tie to it a stout string long enough to go through the piece of conduit. Make a hose connection to fit the conduit, then admit the compressed air into the conduit. This will take the cork with the string on it through any bend you might have in the conduit. After you have forced the string through it is an easy matter to pull the wire through. R. A. JEFFERS.

Fixture Finishing on the Job.—Electrical fixtures in factories and warehouses which have become dirty or tarnished from use may be improved in appearance by painting with bronze paint, and then, if a still better finish is required, varnishing after the paint is thoroughly dry with some light-colored varnish that will give a hard and brilliant coating. I have found the different kinds of spar varnish on the market satisfactory for this purpose. M. J. MORIARTY.

Skinning Fixture Wire.—To skin fixture wire or No. 19 telephone wire without cutting into the conductor itself and thereby weakening it, I file a small groove (a little larger than No. 18 wire) in the cutting edges of my diagonal cutting pliers. By placing the wire into this groove before closing the cutter, the braid will be cut without damage to the copper wire. The insulation can now be pulled off easily and it will be found that the conductor proper is untouched. The same scheme can be used for lamp cord, No. 14 wire or other size of wire by making a notch in the cutters to correspond with each size. Since not more than three sizes are commonly used by the ordinary wireman, this can be easily done. This, of course, is an old scheme, but many wiremen still use a knife for skinning all the wire they install and not only waste time in doing this work but weaken a great many wire ends by cutting into the wire. S. B. TRUNKAT.

Insulating Exposed Buses and Switch Parts in Cabinets.—The term "safety first" is perhaps rather overworked, but when it comes to the covering of "bare live metal parts" I hardly think that we can be too careful. There seems to be a lot of talk nowadays about cabinets with no live metal parts exposed, but to those who already have cabinets with open copper busbars I would suggest that two coats of good insulating shellac be placed over all metal parts which are not used for contact. This is a good and simple safeguard against injury from accidental touching of bare parts. Try it and see. A. S. NICKERSON.

Straightening Heavy Wire.—In wiring for motors in industrial plants, it is frequently possible to rearrange the circuits to advantage and thereby to use some of the old wire for the new motors instead of running all new wire. Before using the old wire that has been taken down or stored it is necessary to straighten it. For the small sizes, No. 14 or smaller, it is easy to pull the wire over some rounded object, say a tool handle, pipe, railing, etc., but this is not so easily done with large wires, such as No. 6 or larger. These wires are best straightened by having a helper take hold at one end and the wireman at the other end, then raise the wire several feet off the floor and slap it with some force against the floor, repeating this a number of times and turning the wire each time a little. A stretch of 20 to 25 feet of wire can be straightened in this way, and sometimes several wires can be straightened at one time. Of course, it is necessary to pick out an even and clean floor. This is an old and effective stunt, but occasionally one sees a wireman that never heard of it. JAMES BURNS.

Uses for a Magnetized Screw Driver.—A useful adjunct to the wireman's kit is a well magnetized medium-sized screw driver. One use for it is to hold the iron washers in place under the lug of flush switches while inserting the screw or bolt. Many other uses will be found for it. V. E. TODD.

To Catch Falling Plaster from Ceiling Outlets.—One of the most irritating things with which the housewife has to contend, when her house is being wired, is the shower of plaster which invariably falls on her delicate parlor and bedroom rugs from the drilling of ceiling outlets. Many funnel and basket schemes have been used to catch this sand and lime, but I believe the following is the simplest. Procure a six-inch funnel and slide it over the bit far enough down so that the operator can see to center the drill. Then, by use of a screw driver, jam a small piece of cloth, which may be kept for this purpose, down between the neck of the funnel and the bit shank. This funnel can be easily applied and as easily removed. It only requires a few seconds extra to make use of this arrangement, and results in "keeping the housewife smiling," which is the desire of every wiring contractor. L. E. BALDWIN.

Simple Form of Plaster Catcher.

Coal-Conveyor Motor Control.—To start and stop a shunt-wound direct-current motor for a coal conveyor in a power house formerly meant a climb of three flights of stairs to the switch and starting-rheostat location twice a day. One trip, for stopping the motor, was saved by using the following plan:

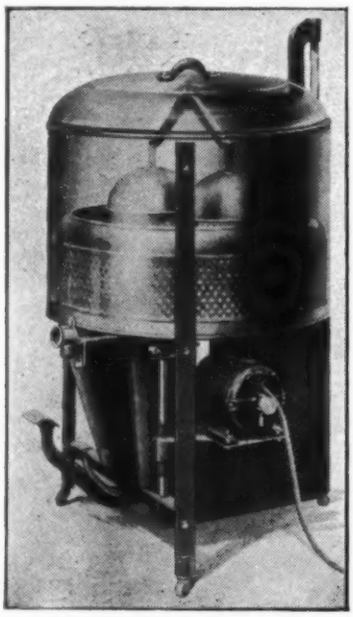
Two pieces of No. 14 rubber-covered wire were connected to the rheostat retaining-magnet coil binding screws. These wires were carried to a well made alarm clock. One wire was soldered to the clock case. The other wire was fastened to a piece of spring brass mounted on a piece of fiber secured to the back of the case near the alarm-winding key. The clock could be set to stop the motor at any time by turning to the correct hour on the alarm dial and winding the alarm-bell key slightly. When the clock operated at the appointed time the two springs would make a contact which would shunt the current around the magnet coil, de-energizing it and thus releasing the arm and stopping the motor. MAURICE J. MORIARTY.

New Electrical Appliances

A Review of the Latest Developments and Information Respecting Electrical and Kindred Mechanical Appliances

Combined Electric Washing and Drying Machine.

One of the distinct advantages of the electric washing machine shown herewith is that the clothes are washed and dried in the same tub. It is said to be the only washing machine on the market that does not require a wringer. This machine, called the Laun-Dry-Ette, is manufactured by the Home Specialty Company, Cleveland, O. It is of



The Laun-Dry-Ette Combined Washer and Dryer.

all-metal construction and consists of an inner tub for the clothes, which is perforated, and an outer tub in which the water is placed. Washing is accomplished by means of two vacuum cups. These cups are suspended on a shaft which works up and down while the inner tub containing the clothes is slowly revolving.

After the latter are washed they are dried right in the same tub. When the washing process is completed the vacuum cups are taken off by removing a small pin fastened at the top of the washing arm and the large foot pedal pressed down as far as it will go. This raises the inner tub out of the water whereby the clothes are ready for the rinsing and drying process. Rinsing may be done with the inner tub in either raised or lowered position, by means of a hose connected to the water faucet. After rinsing, the small hand lever in front of the tub is turned to the left. This starts the inner tub revolving rapidly. The whirling motion resulting causes the water to be thrown from the clothes by centrifugal action, the perforations at the same time permitting air to be sucked through the clothes, thus rapidly airing and drying them. The clothes come from the dryer unwrinkled, buttons intact, colors unaffected, with just enough moisture evenly distributed for proper ironing.

Power for driving both the washer and dryer is furnished by a one-sixth horsepower Westinghouse electric motor especially designed for this class of service, which is carefully insulated from the machine, eliminating any possibility of shock. The motor is controlled by one lever.

Electric Spotlights for Use in Repair Work.

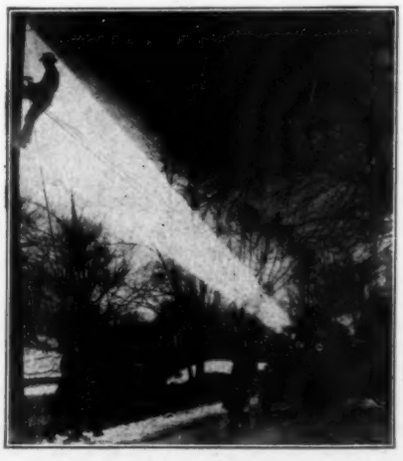
The automobile spotlight has proved itself a wonderfully useful device to the pleasure-car owner by providing a source of light that can be instantly guided in any direction. The illustration herewith shows an interesting use of the spotlight as it is being utilized by street-railway companies and public-service corporations to assist in repair work at night.

The spotlight in the picture and the one that is in widest use for this purpose is the Howe. Its peculiar advantage for this work is due to its ingenious patented bracket. This is a universal-joint bracket, both joints turning at the same time, so that the lamp can instantly be turned to any angle. Though free and easily directed, and moved with very little effort, the lamp stays where it is directed until again moved, because of spring control. The coil springs hold the two joints in a firm, even pressure. Jars and vibrations do not affect the position of the lamp and all wear is completely compensated for.

The Howe spotlight is made entirely from stampings. Its weight is less than two pounds. The reflector is a practically true parabola and gives a concentrated light at even long distances; it is always in focus.

This spotlight fits any windshield through the use of special clamps provided to fit the different styles of windshield frames. By loosening one set screw, the spotlight is easily removed for use as a trouble lamp. The wire is concealed and protected by the bracket and the "on and off" switch of the knob can be operated by a heavily gloved hand and with the same motion with which the lamp is directed.

The line of Howe spotlights includes models with and without rear-view mirror, also a single shell lamp of lighter construction. They are manufactured by the Howe Manufacturing Company, 1713 Michigan Boulevard, Chicago.



Howe Electric Spotlight Used for Trouble Work.

New Type of Electric Locomotive for Heavy Freight Service on Pennsylvania Railroad.

What promises to mark an important epoch in the application of electric motive power to steam-railroad service is the new trial electric locomotive just built at the Altoona shops of the Pennsylvania Railroad and electrically equipped by the Westinghouse Eletric & Manufacturing Company, East Pittsburgh, Pa.

This locomotive was designed for service in hauling the heavy freight traffic over the Allegheny Mountains between Altoona and Johnstown, Pa., a distance of about 37 miles, including the famous Horse Shoe Curve. The freight traffic over this division averages about 300,000 tons a day.

The locomotive will be tried out first over the Philadelphia-Paoli Division, which was electrified about two years ago, and then possibly may be transferred to the Bluefield (W. Va.) Division of the Norfolk & Western Railroad for further trial. The latter road has conditions very similar in many respects to those of the Altoona Division, that is, very heavy freight traffic and steep grades.

This locomotive is similar electrically to the Baldwin-Westinghouse electric engines used on the Norfolk & Western Railroad, deriving its energy from an 11,000-volt, single-phase, 25-cycle system and changing it by means of a phase converter to three-phase current. It is fed through a pantagraph from an overhead contact wire.

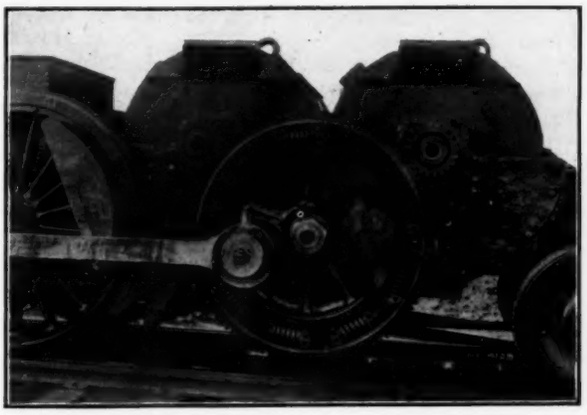
There are four motors, each with a rating of 1200 horsepower, giving the locomotive a rating of 4800 horsepower. Two motors are mounted on each truck frame and geared to a jackshaft from which the driving wheels are driven by connecting rods. The springs in the gears of these jackshafts are so adjusted as to give the effect of a solid gear up to a tractive effort equivalent to 25 per cent of the weight on the drivers, thus producing the solid-gear effect under ordinary operating conditions.

The locomotive is designed for a normal operating speed of 20.6 miles per hour, obtained with the motors in parallel. This speed is the maximum that is considered safe for the heavy trains that these locomotives will be required to negotiate on the grades of the Altoona Division.

Two of these engines, one pushing and one pulling, will haul a 3900-ton train at this speed up the twelve-mile grade of 2 per cent from Altoona to Gallitzin, and a 6300-ton train east bound up the 1 per cent grade from Johnstown to Gallitzin, a distance of 25 miles.

A lower speed of 10.5 miles per hour may be obtained by connecting the motors on the same truck in cascade and this pair in parallel with those on other truck. This speed will only be used around the yards and for especially slow movements. Intermediate speeds can be obtained between zero and the maximum by means of the water-rheostat control system which permits a very close regulation of the tractive effort developed by the locomotive during acceleration. The tractive effort developed at the maximum speed is 87,200 pounds.

The running gear of the locomotive is similar in general construction and appearance to that used on steam locomotives. There are two trucks, each with two motors as explained before, the gearwheels being connected by side rods to the driving wheels, of which there are twelve.



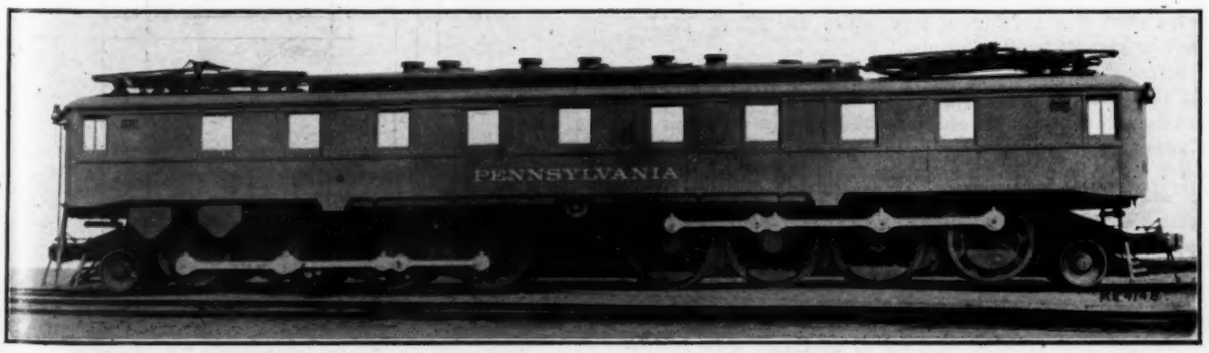
Close View of One of the Motor Trucks of New Pennsylvania Locomotive.

The spring gear for each truck is of the three-point suspension type, one point being over the pony truck and the other two over each frame, consisting of equalizers over each box, elliptical springs between journals, and helical springs outside of the first and third journals. The motor and jackshaft gears are spiral and as the gears on each end of the motor and jackshafts are cut opposite, a herringbone effect is secured.

The center plate is located half way between the first and second axle at an elevation of about the height of the top of frame. Between the second and third axles an auxiliary spring support has been applied for the purpose of equalizing the loads on the various drivers, in other words, to counterbalance the excess weight due to the location of motors between the pony truck and first pair of drivers. The contact between the caps over these springs and the bottom surface of the cab is necessarily a sliding contact.

Each motor truck includes a pony truck of the Pennsylvania Railroad type, with an elliptic spring located each side of the axle and supported on T-links. As the usual T-links alone will not provide sufficient lateral motion, a rocker casting supported by the elliptic springs has been added. The combination T-links and rocker permit sufficient lateral motion for curves of 275-feet radius.

The articulation between the motor trucks is of a construction similar to the pedestal attached to the cab center sills. The lower ends of the pedestal legs are connected together with a tie bar. This permits each truck to rotate around the center of the center plate without restriction. All bearing surfaces in the articulation are plated with manganese steel. The pulling and pushing strains between drawbars carry through the trucks and articulation in a direct plane



New Electric Locomotive for Heavy Freight Service on Mountain Division of Pennsylvania Railroad.

34½ inches above the rails, so that the cab is entirely relieved of these strains.

The principal dimensions and characteristics of this locomotive are as follows:

Over-all length	76 ft. 6¼ ins.
Total wheelbase	63 ft. 11 ins.
Driving wheelbase	38 ft. 8 ins.
Rigid wheelbase	13 ft. 4 ins.
Height from rail to locked position of pantagraph	15 ft. 6 ins.
Height of rail to top of cab	14 ft. 8 ins.
Width over cab body	10 ft. 0 ins.
Over-all width	10 ft. 1 in.
Diameter of driving wheels	72 ins.
Weight on drivers	198 tons
Diameter of pony wheels	36 ins.
Number of driving axles	6
Weight on each pony truck	21 tons
Total weight of locomotive	240 tons
Voltage of locomotive	11,000
Tractive effort	87,200 lbs.
Speed (miles per hour)	20.6
Horsepower at 20.6 m. p. h.	4,800
Load on one per cent grade	3,350 tons

Solenoid-Operated Field Switches for Remote Control.

The General Electric Company, Schenectady, N. Y., has developed a new line of double-pole solenoid-operated field switches. These switches are usually mounted on a base near or attached to the field rheostat, or they may be located on the exciter board remote from the main control board. In all cases they are operated by means of small control switches

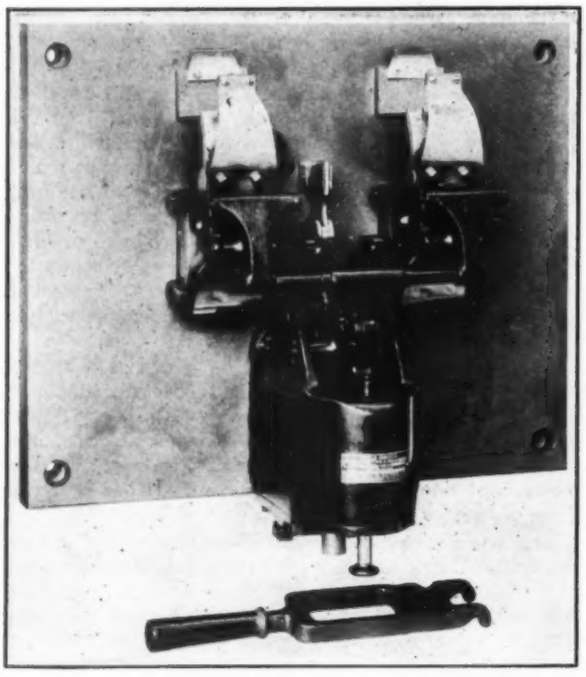


Fig. 1.—Double-Pole, Single-Throw, Solenoid-Operated Field Switch for 800 Amperes, 250 Volts.

of the push and pull-button type which are located on the bench or vertical control boards.

Solenoid-operated field switches are similar in construction to nonautomatic solenoid-operated air circuit-breakers, the principal points of difference being the omission of carbon secondary contacts and the addition of a field-discharge switch. The latter switch is so arranged that the opening of the solenoid-operated field switch introduces a resistance across the field of sufficient value to prevent any injury to the field coil windings by the inductive kick.

Single-pole field switches are provided with operating coils, one for closing and one for tripping, both mounted in a magnet frame immediately below the contact parts. For double-pole field switches, one set of operating coils is provided, the magnet frame being between the two poles.

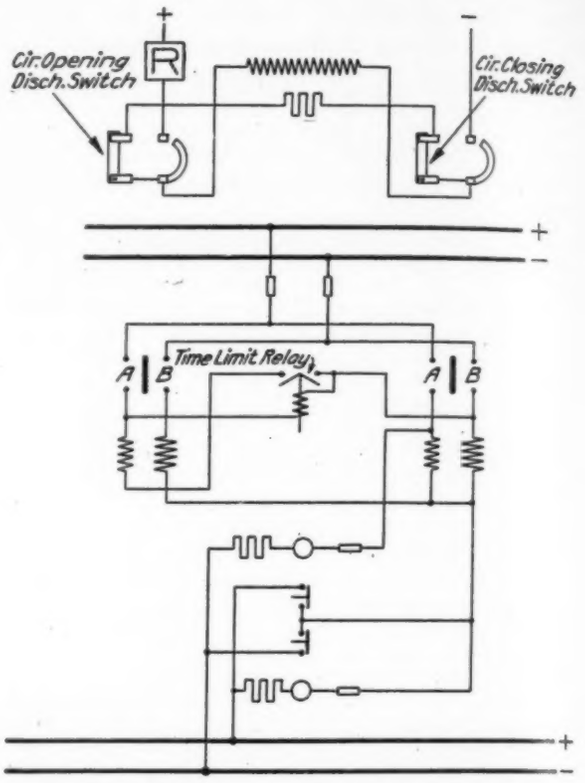


Fig. 2.—Double-Pole, Double-Throw Field Switch for Synchronous Motor Started from Alternating-Current End with Field Open.

Removable handles are provided so that any of these switches may be closed by hand. Insulated buttons, attached

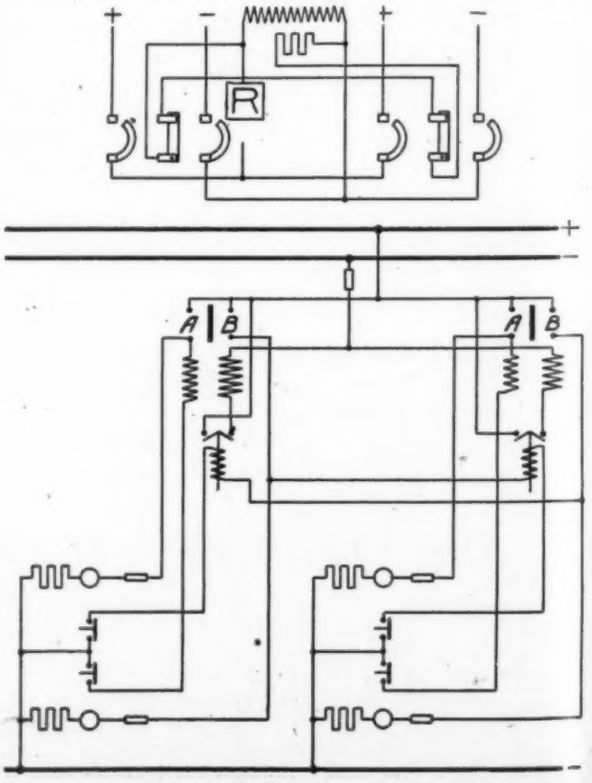


Fig. 3.—Double-Pole, Double-Throw Field Switch for Similar Service as Fig. 2, but Arranged for Two Sources of Field Excitation.

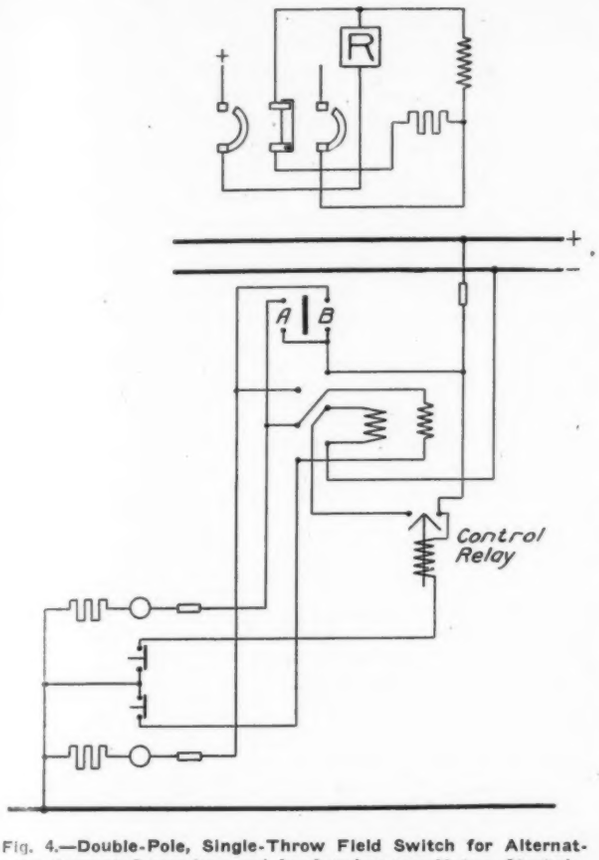


Fig. 4.—Double-Pole, Single-Throw Field Switch for Alternating-Current Generators and for Synchronous Motors Started with Field Short-Circuited Through a Resistance.

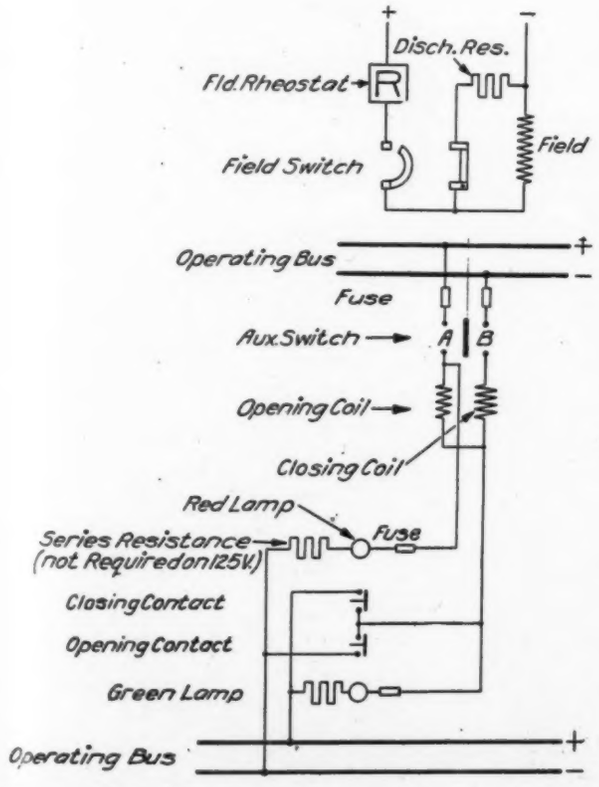


Fig. 5.—Single-Pole, Single-Throw Field Switch for Alternating-Current and Direct-Current Generators.

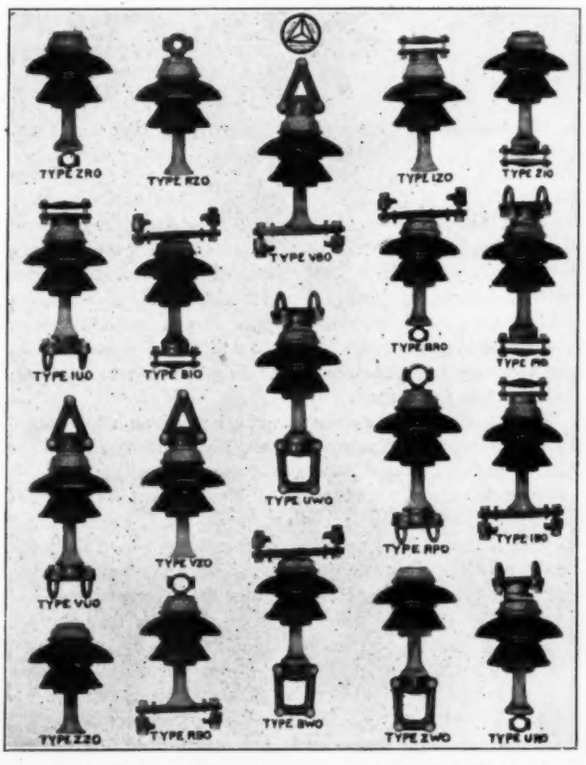
to the tripping-coil plunger and easy of access, provide for hand tripping.

Solenoid-operated field switches for synchronous motors started from the alternating-current source are ordinarily made of two single-pole elements with independent closing and opening coils. In these cases, both poles of the field switch are closed simultaneously, but one pole precedes the other in opening, connecting the discharge resistance across the field. This time delay in the opening of the second pole of the field switch is obtained by means of a time-limit relay connected in the control circuit. The discharge-resistance circuit is opened when this second pole finally opens.

Outdoor-Form High-Tension Busbar Supports.

The growth of the outdoor substation idea has created a demand for high-tension busbar and wiring supports which can be quickly and easily installed.

The Delta-Star Electric Company, Chicago, Ill., has developed a "unit type" design having interchangeable and adjustable hot-galvanized parts. This design enables the supports to be assembled in the field in any desired combination



Typical Assortment of High-Tension Busbar Supports for Outdoor Substations.

and for any size, number or type of conductors. These new supports are made for all commercial voltages up to 88,000. They can be mounted on flat surfaces, pipe work, I-beams, channels, and the various commercial steel shapes. Their use will greatly simplify construction and reduce the cost of outdoor substations and wiring racks.

Crouse-Hinds Imperial Flood-Light Projectors.

The rapid progress in the applications of flood lighting achieved within the last two years is beyond the expectations of its early advocates. At first it was thought that one or two, or at most only a few, types of projecting equipment would meet all possible requirements. The great variety of uses that have been developed, some necessitating very intense illumination of a limited area, others less intense illumination of a rather large area, some ready portability,

others various methods of stationary mounting, are calling for special features that several manufacturers feel can be provided best by an assortment of projector types suited to these varying needs.

This idea is being carried out in the line of projectors manufactured by the Crouse-Hinds Company, Syracuse, N. Y., which are known as the Imperial flood-light projectors. There are seven types of these units, each of which has quite a range of adaptability in its own field. Each projector has a reflector of high efficiency whose shape is a true paraboloid

Fig. 1.—Imperial Flood-Light Projector, Type SCE, for 1,000-Watt Mazda C Lamps.

with definite focal point. The reflectors are made in three sizes with diameters of 9⅝, 12 and 16 inches, respectively. They are made of crystal mirrored glass or of metal. The glass reflectors are accurately ground, buffed and polished to a true geometric surface on both sides. Metal reflectors are of two kinds, nickel-plated copper or polished aluminum; in each case they are spun over accurate steel forms and then given the reflecting-surface finish. For the largest size only metal reflectors are used.

The housing of the reflector consists of an alloy-coated iron that is rust-resisting and thoroughly weatherproof. The casing is well ventilated to dissipate heat from the lamp. It is substantially made and given a black japan finish. The door at the front has a strong, clear glass, round panel, which in the portable type of projector is protected by grids. The door is hinged, usually at the top, and fits tightly to exclude dust, rain, smoke, etc. It gives ready access for lamp renewal and any possible cleaning of the reflecting surface, lamp bulb or inside of the glass panel.

Projectors of the smallest size are made to accommodate tungsten lamps of the vacuum (B) type or gas-filled (C) type of 150 watts or less. Twelve-inch projectors accommodate lamps of 250 watts or less, chiefly of the C type. The 16-inch projectors are for type C 500-watt lamps or smaller; two new types of these large projectors are now ready for the market that are especially adapted for 1000-watt type C lamps. These two latter projectors have the lamps in the vertical or pendent position. In the other projectors the lamps are mounted in the horizontal position.

In the case of these projectors adjustment of the lamp in the focal axis is obtained by means of a knurled wheel at the back of the casing. This permits adjusting the spread of the beam to suit conditions. With the special focus type of lamp, which has a highly concentrated filament, it is possible to secure a very intense beam with a divergence of about 10 degrees, suitable for flood lighting at large distances, say, up to 1000 feet. By drawing the lamp back of the focus the beam can be spread to a divergence of 18 degrees so as to illuminate larger areas; for instance, at a distance of 500 feet it will illuminate a circle about 160 feet in diameter so that no part of it has an illumination of less than 10 per cent of the maximum. In the large projectors with 1000-watt lamps a modified form of focal setting accomplishing similar adjustment of the beam is provided.

One of these newest types of projectors is shown in Fig. 1, from which it is evident that a special ventilator is provided on the top of the case; this is necessary to carry off the great heat of the 1000-watt lamps used. This projector is especially suited for use where a very broad beam of light and of high intensity is needed. It has a special trunnion mounting, the trunnions being under spring tension to hold the projector at any desired adjustment vertically. A handwheel at the side permits locking this adjustment rigidly. The projector can be readily turned in the horizontal plane and then locked in place by means of a set screw in the swivel base. The circuit wires leading in to the lamp enter the casing at the lower back edge, thus requiring but little slack. This projector is known as the type S C E.

The S D E type is similar but has the lamp horizontally mounted and is suitable for up to 500 watts only. A modified form of this latter projector has a swivel base and a quadrant for securing the vertical elevation or depression of the projector. It is known as the type S D A. A portable form of this, known as type S D R, is especially suited for illumination of railroad yards, piers, docks, etc., where the projector must be moved from place to place. It has a wide and heavy base, preventing upsetting.

For mounting on the deck of power boats and similar places where specially severe exposure must be met with, and at the same time convenient control provided for without slack wires, two types of projectors have been specially built. One of these (type S D Y) permits of deck control. Fig. 2 illustrates type S D X, which is similar, but provides for control from the pilot house, on top of which it is mounted. This makes it especially suitable for river, harbor and pleasure boats, and it can also be employed advantageously on watch towers. The pedestal is a heavy casting and the

Fig. 2.—Imperial Flood-Light Projector, Type SDX, with Lever Control, for Deck Mounting on Boats.

casing is thoroughly protected against the action of damp air, salt water, etc.

Control for this projector is obtained from below through an ingenious arrangement. Brass contact rings in the pedestal

provide connection without loose wires, there being contact plugs bearing on these rings under considerable pressure from strong helical springs. Horizontal turning of the projector is obtained readily by swinging the lever sidewise. Vertical adjustment is secured by pushing the lever up or pulling it down; this slides the stem up or down in a friction tube within the pedestal, thus tipping the projector correspondingly. A modified form of this projector has a wheel control instead of the lever. These projectors have an effective range of 2000 feet.

A new form of the type S D A is suited for 1000-watt lamps. It has the lamp in the vertical pendent position and, except for the substitution of a quadrant instead of trunnion mounting, resembles the projector shown in Fig. 1. It is known as the type S C A.

All of these seven types of projectors are built to the well-known Crouse-Hinds standards. They provide an assortment of types and sizes to meet most effectively almost any flood-lighting requirements. More detailed descriptions thereof are contained in the new Crouse-Hinds bulletin No. 303, just off the press.

The Largest Self-Cooled Transformers.

The General Electric Company, Schenectady, N. Y., has built six of the largest self-cooled transformers in the world, aggregating 48,000 kilovolt-amperes for the Carnegie Steel Company. They are single-phase, 25-cycle, 8,000 kilovolt-ampere units each and step the voltage from 44,000 volts to 6,600 volts. There are also taps for 6,930 and 6,270 volts. All of the principles and characteristics of the "circular coil type H" design with the circular disk coil, interleaved windings and three-legged core were incorporated in the construction.

A unique feature of these transformers is the construction of 24 radiators external to the containing tank, giving a radiating surface approximating one million square inches. Cooling is obtained by an automatic circulation of oil through these radiators.

The radiating units consist of vertical flattened tubes rigidly welded into headers which are flanged for bolting to the tanks. The cast-iron elbow between the tank and the radiator is provided with a machined surface where it is bolted to the flanges of the tank and the radiator. The absence of any screwed pipe fittings assures an oiltight joint.

All seams and joints in the tanks and radiators are welded to prevent oil leakage. None are soldered, brazed or riveted. The radiators are self-draining and have no pockets, preventing the accumulation of air at the top or of moisture and sediment at the bottom. These refinements of the "radiator" type of transformer, originated by the General Electric Company, have materially increased the rating of self-cooled transformers and make possible a wider latitude in their field of application.

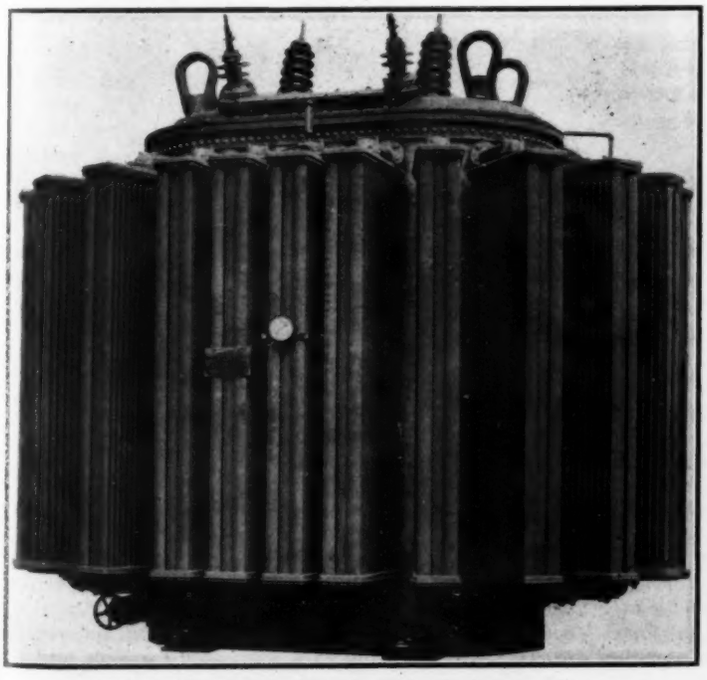
Spartan Plug Adapter for Screw-Base Receptacle.

The majority of current-consuming devices sold and used today have extension cords with separable attachment plugs of the standardized type. To make it possible to use these devices where baseboard receptacles are of the Edison or screw type, the Bryant Electric Company, Bridgeport, Conn., has designed the Spartan screw-base adapter shown herewith.

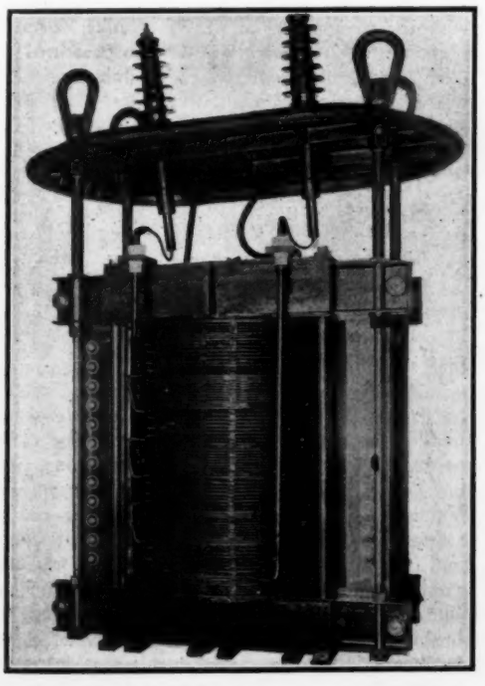
This device is made to be fastened into the standard Edison receptacle by means of the threaded part and will

Compact Adapter for Screw-Base Receptacles.

serve to permanently convert the old-type receptacle into a Spartan device. With this addition it will then be possible to use any one of the sixteen Spartan attachment caps (eight for polarity or non-reversible use and eight reversible) or the caps of any of the several other manufacturers who are producing a similar standard line.



Self-Cooling Outdoor Transformer for 8,000 Kilovolt-Amperes.



Element of Transformer Removed From Tank.

Activities in the Trade

Cooper Hewitt Electric Company announce that its Philadelphia office has been moved from 124 South Eighth Street to the Drexel Building.

Babcock & Wilcox Company, Bayonne, N. J., manufacturer of water-tube boilers, has announced a bonus of ten per cent to employees, based upon their earnings for the past six months.

McCausland Engineering Company, Pennsylvania Building, Philadelphia, Pa., is planning for immediate operations at its new plant at Sixth and Penn Streets, Chester, for the manufacture of high-speed motors.

Imperial Porcelain Company, Trenton, N. J., has commenced the erection of its new plant at Manasquan for the manufacture of electrical porcelain specialties. The first units of the plant will comprise two one-story factories, 130 by 250 feet and 60 by 150 feet, and will cost about $75,000. F. A. Duggan is head of the company.

Delta-Star Electric Company, Chicago, is distributing bulletin No. 31, describing its "Unit type" high-tension busbar and wiring supports. The bulletin contains 198 illustrations showing many important installations. The detailed dimension tables will be of much service to draftsmen and designers responsible for station layouts.

Multi Refillable Fuse Company, 703 Fulton Street, Chicago, Ill., has decided to devote its entire energies to the manufacture of its line of refillable fuses. The various other conduit fittings which the company manufactures have been transferred to the Multi Electrical Manufacturing Company, which has purchased and will continue to make the various types of Multi wire bushings, fuse cutouts, outlet fittings, etc.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., announces that its Chicago branch of the automobile equipment department has been discontinued with the resignation of M. W. Hanke, former local representative. This district will now be combined with and handled from Indianapolis by H. S. Johnson, with the title of western district representative. Mr. Hanks has taken up standardization work with the Society for Automotive Engineers.

The United States Electrical Manufacturing Company, 459-461 East Third Street, Los Angeles, Cal., has issued a folder dealing with its new self-contained electric grinding and buffing tool for machine shops, tire vulcanizers, etc. These outfits were described in our last issue. Their characteristics are well set forth in the circular. The company has also issued a separate circular about its motors, in which their advantages are clearly pointed out.

The R. Thomas & Sons Company, East Liverpool, O., has issued catalog No. 16, covering its extensive line of transmission insulators for all voltages. The catalog has 106 pages, with a large number of illustrations, especially of dimension diagrams of pin-type and suspension insulators. Valuable information is given regarding characteristic construction methods for transmission lines, testing of insulators and other data of importance in power transmission. Aside from the many varieties of pin and suspension insulators, the company makes a large number of wall, floor and roof bushings and train insulators, as well as clamps and other hardware for use with insulators in transmission-line construction.

Hotpoint Electric Heating Company, Ontario, Cal., has issued a new catalog of Hotpoint electric tableware. This gives large-size illustrations of the various types of electric percolators, chafing dishes, toasters, grills, tea kettles, etc. Full data of each device are given and some of the details are described and illustrated.

The Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, Pa., has issued catalog No. 50, dealing with portable testing sets and cable-testing apparatus. These sets are both of the portable and laboratory types and are arranged for rapid and accurate tests of cables. The catalog describes each set, as well as auxiliary apparatus, such as galvanometers, lamp and scale and other reading devices, galvanometer shunts, condensers, resistances, etc.

Woods Motor Vehicle Company, Cottage Grove Avenue and 25th Street, Chicago, Ill., has issued an attractive folder on the Woods "Dual Power" car. This is a very high-class automobile, provided with gasoline engine and electrical motor-generator and battery, whereby it is possible to operate either on the engine or the motor alone or both together. The control for this car is extremely simple and positive. It involves no gear-shifting whatever and is done by means of a few push-buttons, a lever and a pedal.

The Wilson Welder & Metals Company, Inc., New York City, has issued in well-bound form its catalog No. 1, entitled "Electric Welding." It describes the Wilson system of welding, its scope and points of superiority. The motor-generator employed as well as the automatic control panel are well illustrated and specifications of the various parts given. Numerous illustrations and data are given of results obtained from the use of the Wilson system, together with physical tests of the electrically welded joints. Numerous tables of useful data are also included.

The Robbins & Myers Company, Springfield, O., recently took up with its employees the question of holding the annual employees' picnic. Before deciding on this, since there was some discussion of the advisability of utilizing the money which would be ordinarily expended for the picnic for some special national charity, the company took a vote among the employees as to whether they would prefer to have the picnic as usual or to devote the effort to the Red Cross. The result of the vote was about ten to one in favor of having the company donate its picnic appropriation for the Red Cross. A considerable number of the employees have also become members of the American Red Cross and contributed to this worthy cause from their own funds.

John A. Roebling's Sons Company, Trenton, N. J., has issued a new edition of its valuable book "Wire in Electrical Construction." This has been revised completely. The book, as usual, is of convenient size and now consists of 147 pages. Tables of weights and measures occupy the first 12, then follows some 25 pages of conversion tables, also tables giving areas of circles in circular and square measure. Copper wire tables, specifications for copper wire, tables and formulas for stranded copper wire, aluminum wire, steel wire and bronze wire are given. Valuable data are also given on properties of metals, electric transmission of power, galvanized strand and river-crossing wire, copper and steel trolley wires, insulated wire, various insulations and miscellaneous matters. The book is now more complete than ever and very convenient for reference.

The Adapti Company, Cleveland, O., has just issued catalog No. 106 on Adaptiboxes and other fittings. The full assortment of Adaptiboxes are illustrated and detailed. The various covers, special plates and other fittings appropriate for these boxes are also listed. Among other auxiliaries described are loom clamps, connectors, pipe straps, bushings, etc. Lists are also given of fittings of various other manufactures that can be used with the Adaptiboxes, such as various types of switches and receptacles.

Packard Electric Company Insures Employees.—Loyalty to the organization on the part of employees must be earned before it can be bought, and, after it has been earned, a liberal return therefore is a good investment. This is the attitude of the Packard Electric Company of Warren, Ohio, as displayed at a recent meeting of the company's employees. At this meeting it was announced by President N. A. Wolcott that the Packard Electric Company had purchased a group life insurance contract which insures the life of every employee for the amount of one year's salary. The insurance increases with salary increases and also provides an increase of $100 for each year of service after December 1, 1916, with a maximum increase of $500. The premiums are paid wholly by the Packard Electric Company and have no bearing whatsoever on any of the welfare activities of the employees themselves. The benefits derived from this insurance feature are in addition to those provided for by the Ohio Compensation Law. In announcing the establishment of the new benefit plan, Mr. Wolcott stated that it was not an experiment for the purpose of feeling out the attitude of

N. A. Wolcott,
President Packard Electric Company.

the employees. He had worked his way through the electrical industry and knew the view-point of the employee as well as that of the employer—he knew that the Packard employees would recognize this latest move as the logical outcome of the past policy of the company, which policy has been to educate the employees that their interests and the company's interests were alike and that anything which the employees did to further the interests of the company would invariably meet with approval substantially shown. In addition to the distribution of the insurance policies, the meeting was marked by the presentation of a bonus to those employees who have been with the Company for five years or more—the size of the bonus being governed by the number of years each recipient had been connected with the company.

The Electro Dynamic Company, Avenue A, Bayonne, N. J., manufacturer of motors and dynamos, will build two additions to its plant. Contract for erection has been awarded to the John W. Ferguson Company, Paterson, N. J.

Hughes Electric Heating Company, 5660 West Taylor Street, Chicago, Ill., has issued an interesting book entitled "What Every Kitchen Needs." About half of the 48 pages are devoted to cooking recipes by five well-known women that are authorities on cookery. They are all ardent advocates of electric cooking and each of the recipes is written especially for use on a Hughes electric range. The principal advantages of electric cooking are briefly set forth, also the special features of the Hughes ranges. Then follow illustrated descriptions of the 14 chief types of these ranges and of the Hughes electric water heater. This book should make a strong appeal to progressive housewives who wish to cook in the most sanitary and wholesome manner.

Macbeth-Evans Glass Company, Pittsburgh, Pa., has issued bulletin No. 81 on Decora illuminating glassware. This is a highly decorated and very artistic line of glassware for residential and similar purposes, where it is desired to secure the most artistic results in illuminating fixtures by the employment of a glass of pleasing shape combined with beautifully etched and carefully blended colors in decoration. A large number of shapes and decorative designs in more than a half-dozen colors are available in this glassware. The bulletin shows these in their true tints, besides giving data for each type. The company has also issued bulletin No. 109 on the Macbeth lens. This is a new type of multiple-prism lens for use in automobile headlights so as to direct the light upon the roadway and avoid glare from powerful headlights blinding the drivers of automobiles coming from the opposite direction or pedestrians crossing the roadway. This unit consists of five horizontal prisms, inclined at an angle that has been determined with great care. Over the upper portion there is a visor, which acts as a reflector to cut off light that would be wasted in the upward direction.

Speer Carbon Company Building Addition to Its Plant.—Work has already been started on the first unit of a new factory that will form an immense addition to the present large plant of the Speer Carbon Company at St. Mary's, Pa., and which, when entirely completed, will involve the expenditure of approximately $500,000 for additional land, buildings, machinery, equipment and general improvements. The new factory will occupy the plot of ground east of the present plant, and as it is expected that a number of similar units will be erected as labor and materials are available, the company has been acquiring additional land immediately adjoining its present large holdings. The first building, which will be devoted exclusively to the manufacture of the larger sized carbon electrodes for electric furnaces will be 100 by 168 feet in size and constructed entirely of brick, concrete and steel. Glass sidewalls will also be employed, thus permitting a volume of daylight throughout the entire structure. It is expected that the entire plant will be in full operation by September, 1917. The Speer Carbon Company has for several years past manufactured carbon electrodes in the smaller dimensions, the maximum sizes including 4 inches square and 6 inches in diameter and at the present time the orders booked for these sizes are taxing the plant very heavily. The new factory will be equipped to turn out both round and square electrodes in all sizes from 6 to 24 inches in diameter. The demand for carbon electrodes is daily increasing by leaps and bounds, the condition being caused by the enormous demand for tungsten, steel and other products which, in turn, necessitated the installation of large numbers of electric furnaces throughout the entire country. The requirements of the government have also influenced the Speer Carbon Company very largely in the erection of a new plant and once it is in full operation the carbon-electrode shortage will be greatly lessened.

Personal and Biographical

HENRY D. SHUTE, who was promoted from treasurer to vice-president of the Westinghouse Electric & Manufacturing Company, is one of the young veterans in the service of the company, having been associated with the company since 1893. Mr. Shute was born in Somerville, Mass., and graduated in electrical engineering at the Massachusetts Institute of Technology in 1892. He later spent some time studying in Germany at the school of mines in Clausthal and also at the Technical School in Dresden. Mr. Shute has had a wide and varied experience in the Westinghouse Company, and his rise has been rapid. His first two years were spent in the testing department and later he was engaged on erection and laboratory work. He subsequently became associated with L. B. Stillwell. For a short time afterwards he was an assistant foreman of the experimental department in the Niagara Falls power-plant work. Later he was transferred to the engineering department, where he designed alternating-current apparatus, being prominently identified with the steam railroad electrification work done by the Westinghouse company. After five years' service with the company, Mr. Shute took up work in the sales department, in which he remained until

Henry D. Shute.

1903, when he was made assistant to Vice-president L. A. Osborne, which position he filled until 1910, when he was elected acting vice-president. In 1914 Mr. Shute was made treasurer of the company, succeeding T. W. Siemon. While holding this position, Mr. Shute was a member of the Pittsburgh Committee on the Anglo-French Loan, and more recently served on the Manufacturers' Committee which was so successful in securing the large oversubscription by Pittsburgh to the Liberty Loan bonds.

WALTER CARY, who was elected a vice-president of the Westinghouse

Walter Carey.

Electric & Manufacturing Company, has since 1904 been associated with the Westinghouse Lamp Company, filling for the greater part of the time the position of vice-president and general manager. Mr. Cary was born in Milwaukee, Wis., and received his education in the schools of that city, and at Harvard University. After leaving college, he became associated with the Gibbs Electric Company of Milwaukee, as secretary, and in 1889 he with some other local men formed the Milwaukee Electric Company, manufacturers of dynamos and motors, becoming its vice-president and in 1902 becoming president. Mr. Cary is well known throughout the electrical industry, on account of his activities in the field of incandescent lighting.

JAMES L. STONE, new-business manager of the Mansfield (O.) Electric Light & Power Company, a Doherty subsidiary, was recently elected president of the Mansfield Jovian League of America.

C. C. BREWER, manager of the Richmond (Cal.) division of the Western States Gas & Electric Company, has been made a member of the Executive Committee of the Richmond Red Cross, and was also elected general chairman in charge of the one-week membership campaign.

T. H. FARMER, for some time manager of the local business at Shelbyville, Ky., for the Kentucky Utilities Company, has been transferred to New Castle, Ind., and is succeeded at Shelbyville by Lee Hall.

ZELL S. MYERS of Des Moines, has taken charge of the commercial department of the Wisconsin-Minnesota Light & Power Company at Eau Claire, Wis. He succeeds Albert Smith who will work in other departments.

HERBERT THACKER HERR, who was elected a vice-president of the Westinghouse Electric & Manufacturing Company, has been identified with the Westinghouse Machine Company since 1908, filling respectively the positions of general manager, second vice-president and general manager, and finally vice-president and general manager and a director of the company. Mr. Herr was born in Denver, Colo., and received his education in the public schools of Denver, and at Yale University. After leaving college, he became identified in various capacities with the following railroads: Chicago & Northwestern, Denver & Rio Grande, Chicago & Great Western, Atchison, Topeka & Santa Fe, and Norfolk & Western. In 1906 Mr. Herr was made general superintendent of the Denver & Rio Grande Railway, and two years later

H. T. Herr.

retired from the railway field to become vice-president and general manager of the Duquesne Mining & Reduction Company at Duquesne, Ariz., where he remained until he moved to Pittsburgh. Mr. Herr is officially connected with a number of other industrial and financial institutions, being a

director of the Pittsburgh Meter Company, vice-president and director of the Westinghouse Air Spring Company, and Westinghouse Gear & Dynamometer Company, and the Rodman Chemical Company.

I. G. CARL, formerly manager for the telephone company at Perry, Iowa, has been appointed district superintendent for the same company at Davenport.

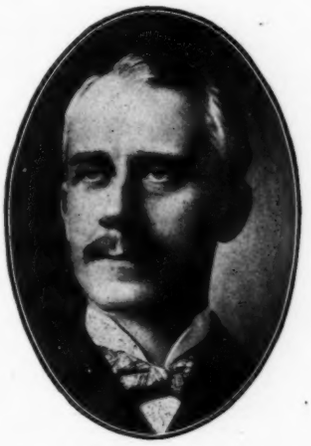
D. W. LACY, district manager of the Cumberland Telephone & Telegraph Company, was in Vicksburg to attend a conference of managers of the Natchez and Vicksburg districts.

GEORGE D. BAXTER, local manager of the Exeter & Hampton Electric Company, Exeter, N. H., has been made successor to J. A. MacAdams, who is manager and purchasing agent of the Exeter, Hampton & Amesburg Street Railway, in addition to his former duties. Mr. MacAdams will enter the engineering office of C. H. Tenney & Company, Boston, Mass.

J. P. PULLIAM has been appointed general manager of the Wisconsin Public Service Company, Gren Bay, Wis. Vice-President C. R. Phenicie, who was also general manager until the appointment of Mr. Pulliam, will in the future give his entire time to his duties as vice-president, and will be engaged largely with construction and development work. Mr. Phenicie will retain his office in Green Bay and handle the affairs of the company in that vicinity jointly with Mr. Pulliam. The latter was formerly vice-president and general manager of the Wisconsin Electric Railway and general manager of the Eastern Wisconsin Railway & Light Company.

A. G. CARSON has been appointed manager of the Eastern Wisconsin Electric Company at Fond du Lac, Wis., in charge of the electric and gas departments there. Mr. Carson began his public service work with the Grand Rapids, Grand Haven & Muskegon Railway in the power and transportation departments. He later became chief engineer of the Winnebago Traction Company at Oshkosh, Wis., and when that company was consolidated with the Eastern Wisconsin Railway & Light Company he was sent to Fond du Lac as superintendent of the electric department. He has held that position for the last eight years, and a year ago was appointed superintendent of the gas department.

GEN. GEORGE H. HARRIES, president of the Louisville (Ky.) Gas & Electric Company, and vice-president of H. M. Byllesby & Company, Chicago, Ill., has offered his services to the government and is expecting shortly to be assigned to duty. General Harries is a graduate of West Point and, before going to Louisville, was for many years in charge of the defenses of the City of Washington. He was retired with the rank of major-general about two years ago. He has been granted a leave of absence by the Byllesby Company and it is reported that he will likely be assigned to the command of a brigade. After the war he will resume his duties with the Byllesby organization.



G. H. Harries.

H. F. BAETZ, who was elected to the position of treasurer of the Westinghouse Electric & Manufacturing Company, was born and raised in Pittsburgh, and educated in the schools of that city, graduating from Allegheny High School in the class of 1887. There is a singular coincidence in connection with his promotion from the position of assistant treasurer, which he has held since 1902. On the date of his election as treasurer, Mr. Baetz had just completed to a day 30 years of service with the Westinghouse Electric & Manufacturing Company, he being a veteran of the longest service class. Mr. Baetz began his business career as a timekeeper in the Garrison plant of the Westinghouse Electric & Manufacturing Company, and after only one year of service, at the youthful age of 18 he was made paymaster of the company. Two years later he was transferred to the accounting department, where he worked until 1899, when he was made acting assistant treasurer and an officer of the company. In 1902 Mr. Baetz was elected assistant treasurer of the company.

H. F. Baetz.

Obituary.

J. C. PETERSON, a graduate engineer in the service of the Louisville Gas & Electric Company, and assistant to the construction superintendent, H. H. Fisher, is dead after an illness of six weeks. His wife and parents survive.

SAMUEL J. DILL, vice-president of the United Gas & Electric Engineering Corporation, died at his home in Jamaica, Long Island, Thursday, June 14. Mr. Dill was born in Walkill, N. Y., October 3, 1864. In his early days he was connected with the Pennsylvania, New York, New Haven & Hartford and West Shore Railroads. Leaving there, he went with the Staten Island Rapid Transit Company, later associating himself with the Metropolitan Street Railway Company of New York City. After this he became superintendent of the 42nd Street & Manhattanville Railroad. He held this position at the time the street railways of New York abandoned the cable-car and adopted electric traction. From New York Mr. Dill went to Ypsilanti, Mich., as general manager of the traction company and later held like positions in Kalamazoo, Mich., and Youngstown, O. It was in 1908 that he became associated with the Susquehanna Railway, Light & Power Company, when he was appointed general manager of the Elmira Water, Light & Railroad Company, one of its subsidiaries. From there he was transferred to New York as assistant to the president of the Susquehanna Railway, Light & Power Company, upon the reorganization of which he was made vice-president of the United Gas & Electric Corporation, and also held the office of vice-president and director in many of its subsidiary companies. At the time of his death he held the position of vice-president of the United Gas & Electric Engineering Corporation and during the past year he devoted all of his time and energy to the oil developments in the Oklahoma field. There is no man in the gas, electric and street railway fraternity who had a wider circle of friends and acquaintances than did Mr. Dill. This was in part due to his extreme geniality and approachability, and he enjoyed the confidence of his many friends because of his attitude of justice and fair play to all with whom he came in contact. There are few men whose loss will be so keenly felt by as many close friends as is that of Mr. Dill.

Current Electrical News

WEEKLY RECORD OF CONSTRUCTION ACTIVITIES

EASTERN STATES.

BINGHAMTON, N. Y.—Work is being started on the 22,000-volt transmission line which is to connect the generating station of Binghamton Light, Heat & Power Company with the power plant of Endicott-Johnson Company. The line is one mile in length and will be utilized to obtain breakdown service. A temporary load of 1,600 kilowatts will be taken on as soon as the new plant is started. Expectations are that later in the year increasing demand for power by Endicott-Johnson Company, whose power plant is reaching its capacity, will call for permanent service.

DUNKIRK, N. Y.—Sealed bids for the construction of an electric system for fish hatchery at Dunkirk will be received by the State Conservation Commission, 156 State Street, Albany, N. Y. Address Lewis F. Pilcher, Capitol, Albany, N. Y.

DUNKIRK, N. Y.—The Niagara & Erie Power Company, Buffalo, has been granted a franchise for the installation of a local distributing system to serve a limited number of consumers.

NEW YORK, N. Y.—The Rockefellor Institute, 26 Broadway, will make extensions and improvements in its three-story power plant at Avenue A and Sixty-fourth Street, to cost about $10,000.

NEW YORK, N. Y.—The New York Telephone Company has awarded a contract to the E. E. Paul Company, 101 Park Avenue, for the construction of its proposed five-story extension to its exchange building at 336 West One Hundred and Fiftieth Street. The structure will be about 66 by 85 feet, and will cost $100,000.

NEW YORK, N. Y.—The Interborough Rapid Transit Company will build a new one-story power plant, about 30 by 60 feet, at 600 West Fifty-ninth Street. The structure will cost about $15,000.

NEW YORK, N. Y.—A one-story power plant, about 36 by 49 feet, will be erected by the Patterson-Sargent Company, 8 Jay Street, at its new paint and varnish works at Long Island City. The entire plant will consist of five main structures, including filter and coke buildings.

NEW YORK, N. Y.—The Merchants' Refrigerating Company, 161 Chambers Street, has filed plans for the construction of a new transformer house at its plant on North Moore Street.

NEW YORK, N. Y.—The Orange County Public Service Corporation, operating in Orange County, has increased its capital to $1,000,000 for expansion.

NEW YORK, N. Y.—The New York Telephone Company will build a two-story brick and stone exchange station, about 40 by 60 feet, on Tooker Avenue, Oyster Bay, L. I., to cost about $35,000.

OSWEGO, N. Y.—In connection with the proposed hydroelectric power station to be built by the city at Dam No. 6, on the Oswego River, it has been brought out at a public court hearing that the water power plant will cost about $139,000, and an auxiliary steam plant as required for operation during four months of the year, $350,000. The initial plant is to have a capacity of about 1,500-horsepower. John A. Bensel is consulting engineer.

HACKETTSTOWN, N. J.—The Hackettstown Electric Light Company is negotiating with the New Jersey Power & Light Company, Dover, for power supply to operate the local system. The Hackettstown company is considering the construction of a new transmission line to connect with the New Jersey Power system at Stanhope-Netcong.

MERCHANTVILLE, N. J.—The Public Service Electric Company will build a new distributing line to connect the local street-lighting system with its power station at Burlington.

NEWARK, N. J.—John Engelhorn will build a new one-story boiler plant at his meat packing works, 19 Avenue L. Plans for the structure have been filed.

NEWARK, N. J.—The Board of Trustees of the Newark City Home will receive bids up to 3:30 p. m., July 16, for electrical work at the institution. Carl Heller is secretary.

PAULSBORO, N. J.—The Borough Council is planning the installation of a fire alarm system. The Bell Telephone Company is negotiating with the town for the improvement.

PLAINFIELD, N. J.—The Public Service Electric Company has commenced the installation of an underground system for its transmission lines in East Second Street.

PORT READING, N. J.—An Electric Light Commission has been organized for the second district of Woodbridge Township and an appropriation made for street-lighting. Wilbur Turner is secretary.

SOUTH AMBOY, N. J.—The Common Council is considering the installation of an improved street-lighting system. The Middlesex & Monmouth Electric Light, Heat & Power Company is furnishing the local service.

WESTMONT, N. J.—The Public Service Electric Company is considering the extension of its lines in the West Collingswood section for lighting service and commercial supply.

BANGOR, PA.—The Pennsylvania Utilities Company has signed a contract with the North Bangor Slate Company for furnishing electric power for works.

BELLEFONTE, PA.—The State-Centre Electric Company has made application to the Public Service Commission for permission to acquire the Millheim Electric Company, Millheim, and merge the two systems.

HAZLETON, PA.—The Harwood Electric Company will furnish electric power for the operation of the Girard Mammoth Colliery, near Raven Run.

NORRISTOWN, PA.—The Norristown Steam Heat Company, serving a number of consumers in the central district of the city, has issued a notice to its customers announcing an advance in rates of service of 40 per cent to office buildings and 60 per cent to residences.

MILLERSBURG, PA.—The Millersburg Electric Light, Heat & Power Company has commenced the construction of new transmission lines from Juniata to Montgomery's Ferry, through Buck's Valley, and thence to Halifax, where the company will furnish a street-lighting service. It is expected to have this latter improvement ready for operation before the close of the year. The company is also planning to acquire the Liverpool Electric Company, and will merge the system with its properties. A new transmission line is planned to Liverpool.

PHILADELPHIA, PA.—The proposed addition to the substation of the Philadelphia Electric Company at Schuylkill Avenue and Christian Street, will be one-story, reinforced concrete, 55 by 65 feet. John R. Wiggins & Company, Otis Building, have the contract.

PHILADELPHIA, PA.—A one-story power plant, 30 by 50 feet, will be constructed by the Crew-Levick Company, Land Title Building, at its new oil works on Pett's Island, in the Delaware River. Henry L. Doherty & Company, 60 Wall Street, New York, operate this company.

PHILADELPHIA, PA.—The new power plants to be erected by the Bureau of Yards & Docks, Washington, D. C., at the Philadelphia and Norfolk, Va., navy yards, will be one-story structures, reinforced concrete, each about 100 by 265 feet. The plants will cost $253,864 and $257,624, respectively. The M. J. Roche Construction Company, Cincinnati, has the contract for erection.

POTTSTOWN, PA. — The Bell Telephone Company has completed a new exchange station for local service, and plans for the immediate installation of equipment, to cost about $60,000. The station structure cost $50,000.

PUNXSUTAWNEY, PA.—The Jefferson Electric Company has applied to the Public Service Commission for approval of a new schedule of rates, arranged on a sliding scale.

READING, PA.—The Metropolitan Electric Company is reported to be planning for the rebuilding of its electric power station at Klapperthal, destroyed a few years ago by fire. The new plant is estimated to cost $100,000. W. S. Barstow & Company, 50 Pine Street, New York, operate this company.

WILMINGTON, DEL.—The Wilmington & Philadelphia Traction Company has been awarded a contract for a period of one year, effective July 1, for furnishing electric energy for the Wilmington hundred bridges.

BALTIMORE, MD.—The Consolidated Gas, Electric Light & Power Company will build a new brick and concrete power plant at Westport. George Beadenkopf, Baltimore, is architect for the company.

RISING SUN, MD.—Borough officials have approved plans for the installation of a municipal electric lighting plant.

CUMBERLAND, MD.—The Kelly-Springfield Tire Company, Akron, Ohio, will build a large power plant for works operation at its proposed new tire manufacturing plant. The plant is estimated to cost over $2,000,000. It is understood that contracts for considerable equipment have been placed. S. Diescher & Sons, Pittsburgh, Pa., are engineers.

WASHINGTON, D. C.—The Bureau of Standards has taken bids for the erection of a new two-story radio laboratory to be located at Connecticut Avenue and Pierce Mill Road. The structure will be about 37 by 165 feet.

LYNCHBURG, VA.—Electrical equipment will be installed in the new pumping and filtration plant to be erected by the city. H. L. Shaner is city engineer.

MORGANTOWN, W. VA.—The West Virginia Traction & Electric Company will increase the capacity of its local plant by the installation of a 1,250-kilowatt turbo-generator unit, giving the plant a total capacity of 3,500 kilowatts. The generator will be moved from the plant of an affiliated company at Lebanon, Pa. W. S. Barstow & Company, 50 Pine Street, New York, operate this property.

PARKERSBURG, W. VA.—Effective July 1, the Monongahela Valley Traction Company, Fairmont, will take over and operate the properties of the Kanawha Traction & Electric Company, Parkersburg and vicinity. Stockholders have approved of this consolidation for a period of five years.

CHARLESTON, N. C.—The Colonial Power & Light Company is building a new transmission line from Charleston to Claremont. The line will carry 44,000 volts, and is expected to be ready for operation early in July.

WILMINGTON, N. C.—A complete power plant, consisting of boilers, engines, generator and switchboard, with auxiliary equipment, will be constructed by the Cape Fear Packing Company at its new packing plant to be erected at Navassa, on the Cape Fear River. Bids will be received for structures and equipment up to July 11. The Packers' Architectural & Engineering Company, Chicago, is engineer; Wilson & Sompayrac, Columbia, S. C., architects.

MACON, GA.—The Macon Securities Company will develop Ingleside, a 100-acre subdivision near the Forsyth road. Sewers will also be constructed, gas mains laid, electric lights installed and a sunken garden constructed; sidewalks are to be bordered with trees and shrubbery. Address Louis A. Tharpe, owner.

AMERICUS, GA.—The Americus Lighting Company is planning for the acquisition of the Americus Public Service Company. Bonds for $250,000 will be issued and stock for $100,000 sold for this purchase, and to provide for proposed extensions and improvements in the plant and system.

TAMPA, FLA.—The Mugge Estate plans a number of improvements at Bay View hotel, including the installation of a private water plant and a private electric plant and the construction of a sun parlor, to be glass-encased and steam heated.

NORTH CENTRAL STATES.

ASHTABULA, O.—The Ashtabula Electric Service Company has been incorporated with $15,000 capital. R. A. Wentz, manager.

CAMDEN, O.—The electric lighting plant at Camden and the water rights at Cambria have been sold to S. P. Hall and other parties from Angola.

DAYTON, O.—The C. D. & M. Electric Company was incorporated by Samuel L. Finn and Daniel Blau. This company will take over the road of the old C. D. & M. The new company asked the Public Utilities Commission for permission to issue $1,000,000 of common stock, $1,000,000 of preferred stock and not to exceed $10,000,000 of 20-year bonds, to be secured by mortgages on all property and the franchise.

CLEVELAND, O.—Plans have been completed for a $3,500,000 subway and terminal project. Address Mayor Davis.

PORT CLINTON, O.—Ottawa County Telephone Company will install a new manual system in this city, replacing the present system.

YOUNGSTOWN, O.—The Cleveland & Mahoning Valley Traction Company is planning to build a new interurban line from Warren to Midland, the new industrial town being built by the Carnegie Steel Company west of here. The C. & M. V. operates at present as far as Warren from Ravenna, in Portage County. Right of way for the extension has been secured. Address general manager.

WOOSTER, O.—The Central Union Telephone Company, known as the Bell, is planning better service between Wooster and Cleveland. The company intends to change the entrance of its lines into Wooster through the eastern part of the city and to build additional lines to Cleveland.

AUBURN, IND.—The B. & O. railroad will have its passenger station, the platform, the tower and the freight office at Auburn Junction lighted with electricity furnished by the city of Auburn. Address city clerk.

Petersburg, Ind.—The franchise of the local electric light plant was transferred to the Indiana Power & Water Company, lic Service Commission its value was placed at $48,000. The power company is having recorded a mortgage of $1,500,000 on its plants in Knox, Sullivan, Greene and Daviess Counties to the Continental and Commercial Trust & Savings Bank of Chicago.

WINAMAC, IND.—The Winamac Telephone Company has bought the Star City and Pulaski exchanges.

CHARLESTON, ILL.—The Burback Electrical Company has been incorporated with $1,000 capital. A. W. Burback, manager.

SADORUS, ILL.—The Peoples' Toll Company has been incorporated with $2,418 capital. A. E. Goudie is an incorporator.

BAYFIELD, WIS. — Bayfield's new white way, which will make the city one of the finest of its size, is being constructed.

CHIPPEWA FALLS, WIS.—The Wisconsin-Minnesota Light & Power Company has purchased the transmission line between this city and Bloomer; also the power house of the Bloomer Electric Light & Power Company, the deed being filed recently with the local register of deeds. The consideration was $5,000. The transformer and feeder regulator are not included in the sale.

MILWAUKEE, WIS.—The street railway committee of the Common Council has approved a resolution requiring the Milwaukee Electric Railway & Light Company to extend its tracks on Mitchell Street and Burnham Street from Muskego Avenue to Twenty-sixth Avenue. This resolution was passed despite the protest of Mr. Stearns, vice president of the company.

DATES AHEAD.

New England Section, National Electric Light Association. Annual convention, New London, Conn., September 11 to 14. Secretary, Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Northwest Section, National Electric Light Association. Annual convention, Spokane, Wash., September 12 to 15. Secretary, J. F. Farquhar, Washington Water Power Company, Spokane, Wash.

American Electrochemical Society. Annual convention, Fittsburgh, Pa., October 3 to 6. Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa.

National Electrical Contractors' Association of the United States. Annual convention, New Orleans, La., October 10 to 13. Secretary, H. C. Brown, Utica, N. Y.

MONTICELLO, WIS.—A special election will be held July 5, when the question of voting bonds in the sum of $5,650 will be decided. The bonds will run twelve years at 5 per cent interest. The City Council desires to remove the electric lighting plant to a point abutting the right-of-way of the Illinois Central Railroad, and it is estimated that $4,800 will be required for this work. The remaining $850 will be for the purchase.

WAUPACA, WIS.—The Waupaca Electric Service & Railway Company is making improvements to its electric power system as well as the railway. A new 225-horsepower electric generator will soon be installed and put in operation. The engineering work of making maps of the town and records of the poles, wires and transformers has been in progress since February. The system is also to be changed to 60-cycle. It is planned to extend the electric light wires to the Veterans' Home and to the Lakes, giving better service to these places, and also to farms in this vicinity.

WAUSAU, WIS.—The Wisconsin Valley Electric Company has filed a trust deed amounting to $15,000,000, covering all the property of the company, now owned or subsequently to be acquired, in the office of the registers of deeds in Marathon, Lincoln and Portage counties, in favor of Wisconsin Valley Trust Company. It is understood extensive improvements and development are contemplated, including dam construction, enlarged generating plants and line extensions.

WAUSAU, WIS.—The Wausau Telephone Company is at work making extensions to its lines in the country and by fall will have over twenty miles of new lines.

DULUTH, MINN.—$40,000 will be appropriated for the installation of an electric pump at Lakewood pumping station. Address city engineer.

HUTCHINSON, MINN.—The holdings of the Coler Campbell interests in Minnesota consisting of the Northwest Light & Power Company of Hutchinson and its transmission lines, the Renville Electrical Company, the Minnesota Valley Power Company; also the Pipestone plant and transmission lines, which are a division of the Northwest Light & Power Company, have been sold to the Northern States Power Company, a corporation operating in 150 towns and cities in Minnesota, the Dakotas, Wisconsin, Illinois and Iowa. It supplies the twin Cities and gets its power largely from St. Anthony Falls, Chippewa Falls, Cannon Falls, Taylors Falls and Coon Rapids, and this purchase gives it the large power at Minnesota Falls. In addition to its water powers the Northern States maintains for low-water emergencies a number of steam plants, the largest, 40,000 horsepower, being at Minneapolis with 27,000 horsepower to be installed. It has a total of 100,000 horsepower and has 800 miles of transmission lines, serving 900,000 population.

MINNEAPOLIS, MINN.—Plans for improvements and new extensions to cost $10,000,000, which will be carried out when the railroad situation again becomes normal, will be outlined to stockholders of the Electric Short Line Railway Company, by W. L. Luce, president. Officers of the road plan to float a bond issue of $10,000,000, but it will not be put on the market until conditions in the financial world are favorable.

ST. PAUL, MINN.—Sealed bids will be received at the office of the Minnesota State Board of Control, State Capitol, July 10, for furnishing and installation complete, including the glassware and lamps and fixtures for the Minnesota Historical Society building, St. Paul, Minn., in accordance with schedule prepared by C. H. Johnson, architect.

ATHENS, IA.—The Public Utilities Commission has granted Athens Electric Company permission to build an electric transmission line from Athens to Petersburg.

DAVENPORT, IA.—The city will install 15 arc lights in the city. Address B. M. Raben, chairman.

DOWS, IA.—At an election held the Wright & Franklin County Telephone Company was granted a franchise to construct and operate a new telephone system. The concern expects to construct a modern system. The wires in town will be under ground, using high-tension electric wires. Address J. G. Freese, president.

KEOKUK, IA.—The Keokuk Electric Company will extend trolley and power transmission line between Hamilton and Warsaw.

LE MARS, IA.—The power station that is to supply the current for the Iowa Heat, Light & Power Company's plant in Plymouth and nearby counties will be located in Le Mars. Address Lindsay Hooper, manager of the Hooper, Kimball & Williams Company of Boston, Mass.

THOR, IA.—Bonds in amount of $4,000 have been sold for the installation of an electric light system. Address town clerk.

CLINTON, MO.—Morrison & McCall of St. Louis, Mo., have purchased municipal electric light and water plant. Contemplate improvements.

LADDONIA, MO.—City voted to construct electric light system. Address the mayor.

CONCORDIA, KAN.—The majority of the stock of Concordia Electric Light & Power Company has been sold to the Commonwealth Light & Power Company, New York, negotiations of sale having been conducted by L. K. Green, of Concordia. L. S. Small is general manager for the reorganized company.

CHADRON, NEB.—Work on the white way has been commenced, the surveying has all been done and the majority of the post foundations have been placed. All material is here for the completion of the work except the cable.

GREELEY, NEB.—An election will be held to decide the question of issuing $13,000 for municipal light and heating plant.

KEARNEY, NEB.—The franchise asked by the Central Powers Company was authorized by 145 majority out of a total of 651 votes cast.

OMAHA, NEB.—The local telephone company will construct a 15-story building for its headquarters, estimated to cost $750,000. Plans are about ready and bids will be received soon.

OMAHA, NEB.—The Nebraska Telephone Company will erect a $750,000 building after plans prepared by Architect Geo. B. Prinz, 1033 Omaha National Bank building.

BONESTEEL, S. D.—A special election has been called for June 28 to vote upon the question of issuing bonds in the amount of $15,000 for an enlargement of the water works and $14,000 for the installing of a municipal electric light plant.

SOUTH CENTRAL STATES.

ASHLAND, KY.—The City Council has appropriated $5,000 for installation of a modern street lighting system in the downtown district.

LOUISVILLE, KY.—A cantonment is to be established at Audubon Park, 12 miles from Louisville. Preparations are under way by the Louisville Gas & Electric Company for providing electric service. It is estimated that the lighting and power requirements of the soldier city will approximate 3,500 kilowatts. Plans for laying gas mains to furnish natural gas for heating and cooking are being held in abeyance, pending the decision of the War Department as to the character of fuel to be used. Address James B. Wilson, chief engineer, Louisville.

PADUCAH, KY.—The report of F. W. Ballard of Cleveland, O., engineer, on electric light plans is being awaited by City Commissioner W. A. Gardner, who is making a fight for a municipal plant to furnish lights and power.

PADUCAH, KY.—The white way will be extended by the addition of twenty-five posts on Broadway, as well as posts on Fourth Street. The contract has been let and installation will begin in the near future.

SHEPHERDSVILLE, KY.—A group of local citizens were purchasers of the Shepherdsville Light & Ice Company, at a recent trustee's sale, paying $2,250 for the property. They will organize a company and continue operation of the plant.

WHITESBURG, KY.—The Caudill Coal Company, recently incorporated here, is asking for prices of electrical machinery and supplies for coal mining. L. W. Fields is secretary-manager.

ALBANY, ALA.—The Alabama Power Company is planning for extensions in its plant and system at Albany to cost about $10,000.

BLUE BLUFF, ARK.—City Council is planning for city lighting, including installations for a white way, and it is reported a contract will be made with the Pine Bluff Company for the proposed work.

HAILEYVILLE, OKLA.—The city will consider proposition to construct an electric light plant. Address the mayor.

MANGUM, OKLA.—Engineer Griffin of Fort Worth has secured permission from the Commissioners to draw plans for the municipal light and power plant, which has been provided for by a bond election. Mr. Griffin represents the Baltimore Iron Works. They will draw plans and specifications for a complete and modern plant and submit same to the board. The city is obligated in no way for the plans and will only make a contract provided every detail and price and contract terms are found to warrant a contract.

OKLAHOMA CITY, OKLA.—The Oklahoma Gas & Electric Company will increase its capital stock and will purchase several gas and electric plants operating in the state of Oklahoma and which will be operated jointly by that concern. Improvements will be made. Address W. K. Molinard, local manager.

TEMPLE, OKLA.—An election has been called for July 13 to submit to the voters of Temple the proposition of granting a franchise to John C. Keys of Lawton for natural gas and electric plants. Gas would be supplied from the Keys well, northeast of here, and electricity would be furnished by the Lawton plant belonging to Mr. Keys.

FORT WORTH, TEX.—The Fort Worth Power & Light Company will extend electric light connections to Upper Riverside in the near future. Address the general manager.

WESTERN STATES.

SEWARD, ALASKA.—The Alaskan Engineering Commission will soon start work on the telephone line to connect this place and Fairbanks.

BUTTE, MONT.—A crew of civil engineers, working under the direction of the surveyor of the Montana Power Company, commenced a survey of a power line and electric railway from Twin Bridges to the Bielenberg-Higgins and Lake Shore mines. The rail line will be 14 miles in length. It is being built under the supervision of the power company, but is to be the property of the Bielenberg-Higgins and Lake Shore mines, which will pay the cost of construction, estimated at about $26,000. A high-tension line from Twin Bridges, carrying about 49,000 volts, will supply the power, but will be reduced to about 2,000 volts at the Higgins mines and carried from there to the Lake Shore property. At each mine a 100-ton mill is to be erected. F. J. Staral is manager of the Lake Shore.

GREAT FALLS, MONT.—Mountain States Telephone Company will start work shortly on additions and improvements to local phone system at a cost of $200,000. R. F. Carney is manager.

TWIN BRIDGES, MONT.—It is reported that a company is being organized to build an electric line from Dillon, on the Oregon Short Line, to Piedmont, on the Milwaukee via Twin Bridges, a distance of 60 miles. The line would tap the fertile Beaverhead and Jefferson valleys. Address A. J. Wilcomb.

CHLORIDE, ARIZ.—Tonnaut & Sladek have the contract to erect the new transformer building for the Desert Power & Water Company.

PRESCOTT, ARIZ.—The Mountain States Telephone & Telegraph Company is surveying for a new line between Prescott and Ash Fork, the line to be about 64 miles long.

SALT LAKE CITY, UTAH.—The first certificate of convenience and necessity issued by the state of Utah was granted to the Southern Utah Power Company, which desires to increase its power to 12,000 horsepower. The permit given includes the following items: Installation of a 100-horsepower engine on Panguitch Creek, and a distributing system for Panguitch; a power line from Beaver station to Marysvale; a power line from Sevier to Marysvale; a distributing system for Marysvale, and a line to the Deer Trail mine to carry 300-horsepower. The company plans to ask for an additional certificate for a 2,500 horsepower plant below the works at Beaver. It is now developing 3,500 horsepower at Beaver. By the construction of a dam and the forming of a storage system the company expects to obtain 12,000 horsepower. Extensions to Milford and Newhouse, and into the Lincoln mining district are planned.

COLVILLE, WASH.—J. W. Coffin, manager of Little Pend O'Reille Telephone Company, states that he now has funds for material to construct a 26-mile telephone line from Colville to Middleport.

EATONVILLE, WASH.—The town of Eatonville has taken over, temporarily, the electrical stock and supplies of Ed Christensen and can supply light patrons with globes and other electrical supplies.

OLYMPIA, WASH.—The county commissioners have granted to the Puget Sound Traction, Light & Power Company a 25-year franchise for the construction of a transmission line from Brown's ranch to the Log Cabin in this city.

SEATTLE, WASH.—A. H. Dimock, city engineer, estimates that the proposed extension of the city street car system, by the construction of an elevated street railway on Washington Street from Fourth Avenue south to Railroad Avenue, and along Railroad Avenue, Whatcom Avenue and West Spokane Street to West Waterway, will cost $937,000.

SEATTLE, WASH.—Orders of the Washington State Public Service Commission, requiring the Puget Sound Traction Company to run through cars on its Ballard Beach line in Seattle and increase passenger seating capacity on the Alki Point and Fauntleroy Park lines have been sustained and made operative by the Supreme Court, which has affirmed the dismissal of the traction company's injunction suit.

SEATTLE, WASH.—Bids are being received by the secretary of the Board of Public Works for four oil switches for the auxiliary steam electric station at Eastlake Avenue, and Nelson Place, and for two transformers for a sub-station tie, one between the Seventh Avenue sub-station and the steam plant, the other for the Aloha Street sub-station.

SPOKANE, WASH.—Petitions have been filed for street lighting on Post Street from Third to Trent and have been referred to the city engineer.

ARCADIA, CAL.—The California Railroad Commission has approved the plans and specifications of the Atchison, Topeka & Santa Fe Railway Company, the Southern Pacific Company and the Pacific Electric Company for an interlocking switch and signal plant at Arcadia.

FRESNO, CAL.—Congress having finally apportioned $253,000 for the Yosemite National Park, part of it for a 2,000-kilowatt power plant at Cascade Falls, Supervisor Lewis will be able to complete the new power plant this Fall.

FRESNO, CAL.—A contract has been let by the San Joaquin Light & Power Corporation for the erection of a 250-horsepower reciprocating booster pump station in the vicinity of Taft, Kern County, at a cost of about $50,000.

FRESNO, CAL.—The cost of installing an electrolier system on J. Street, between Inyo and Los Angeles Streets, will be $7,194.

GLENDORA, CAL.—The Pacific Electric Railway Company has been surveying a route between Glendora and San Dimas for the extension of the Glendora line to make connection with the Los Angeles, Pomona and San Bernardino through line at San Dimas.

LOS ANGELES, CAL.—The Board of Public Works is receiving bids for lighting the San Pedro district for the period beginning July 1, 1917, and ending June 30, 1918.

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRIC COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

	Div. rate per cent.	Bid June 19.	Bid June 26.
Public Utilities—			
Adirondack Electric Power of Glens Falls, common	..	20	20
Adirondack Electric Power of Glens Falls, preferred	6	75	73½
American Gas & Electric of New York, common	10+extra	120	118
American Gas & Electric of New York, preferred	6	48	47¾
American Light & Traction of New York, common	..	329	328
American Light & Traction of New York, preferred	6	110	110
American Power & Light of New York, common	4	66	66
American Power & Light of New York, preferred	6	88	87
American Public Utilities of Grand Rapids, common	..	28	28
American Public Utilities of Grand Rapids, preferred	6	64	59
American Telephone and Telegraph of New York	..	121⅝	123
American Water Works & Elec. of New York, common	..	7	7¾
American Water Works & Elec. of New York, particip.	7	23	23
American Water Works & Elec. of New York, first preferred	..	75	76
Appalachian Power of Bluefield, common	..	5	5
Appalachian Power of Bluefield, preferred	7	30	30
Cities Service of New York, common	6+extra	283	283
Cities Service of New York, preferred	6	85	86¼
Commonwealth Edison of Chicago	8	122	.....
Comm. Power, Railway & Light of Jackson, common	4	48	48
Comm. Power, Railway & Light of Jackson, preferred	6	74	75
Federal Light & Traction of New York, common	..	10	13
Federal Light & Traction of New York, preferred	..	42	44
Illinois Northern Utilities of Dixon	6	78	78
Middle West Utilities of Chicago, common	2+2 extra	43	40
Middle West Utilities of Chicago, preferred	6	70	69
Northern States Power of Chicago, common	7	97	96
Northern States Power of Chicago, preferred	7	100	97
Pacific Gas & Electric of San Francisco, common	5	59	58
Pacific Gas & Electric of San Francisco, preferred	6	89	89
Public Service of Northern Illinois, Chicago, common	7	92¼	93
Public Service of Northern Illinois, Chicago, preferred	6	97	96
Republic Railway & Light of Youngstown, common	4	30¾	35
Republic Railway & Light of Youngstown, preferred	6	64½	67½
Standard Gas & Electric of Chicago, common	..	12	11
Standard Gas & Electric of Chicago, preferred	6	36	35
Tennessee Railway, Light & Power of Chattanooga, common	..	5½	5¾
Tennessee Railway, Light & Power of Chattanooga, preferred	6	25	27
United Light & Railways of Grand Rapids, common	4	39	38
United Light & Railways of Grand Rapids, preferred	6	68	68
Western Power of San Francisco, common	..	14½	14
Western Power of San Francisco, preferred	6	52	54
Western Union Telegraph of New York	extra	93½	92
Industrials—			
Electric Storage Battery of Philadelphia, common	4	62⅞	60
General Electric of Schenectady	8	162	160
National Carbon of Cleveland, common	8	*75	73
National Carbon of Cleveland, preferred	7	*133	*133
Westinghouse Electric & Mfg. of Pittsburgh, common	5+extra	53½	*52¾
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	68½	68½

*Last Sale.

FINANCIAL NOTES

William P. Bonbright & Company, Inc., and H. M. Byllesby & Company have underwritten and are offering to investors a new issue of $2,250,000, two-year, 6 per cent gold notes of the Oklahoma Gas & Electric Company. The proceeds of these notes will be used to retire the company's outstanding 6 per cent debenture bonds, the floating indebtedness, including the cost of new properties, and for extensions and additions. The company has completed arrangements for acquiring the properties of the Enid Electric & Gas Company, the electric lighting business in the town of Norman, Okla., and control by stock ownership of the Muskogee Gas & Electric Company. The territory served, as enlarged by purchases, will comprise Oklahoma City, Sapulpa, Enid, and neighboring sections.

An extra dividend of 1 per cent on the common stock for the quarter ending June 30 has been declared by the directors of the Crocker-Wheeler Company, electrical machinery manufacturers, of Ampere, N. J. The directors also declared the regular dividends of 1¾ per cent on the preferred and 2 per cent on the common stock for the same period. A special dividend of one-half of 1 per cent for the benefit of the American Red Cross was declared by the directors of the Crocker-Wheeler Company, electrical machinery manufacturers, of Ampere, N. J., to be known as the Red Cross dividend.

Wisconsin Edison Company's earnings for May were as follows: Gross earnings, $966,074; net after expenses, $256,084.

Reports of Earnings.

CITIES SERVICE.

	1917.	1916.
May gross	$ 1,565,426	$ 709,085
Net after expenses	1,537,085	688,973
Surplus after charges	1,536,850	644,852
Bal. after pfd. divs.	1,237,726	473,497
12 months' gross	15,218,273	6,012,969
Net after expenses	14,931,235	5,811,625
Surplus after charges	14,888,610	5,308,171
Bal. after pfd. divs.	*11,850,442	3,548,624

*Equivalent to $53.48 on the common stock, compared with $21.98 for the year ended May 31, 1916.

VIRGINIA RAILWAY & POWER.

Report of earnings of Virginia Railway & Power Company for May and eleven months ended May 31 compares as follows.

	1917.	1916.
May gross	$ 515,250	$ 478,601
Net from operation	251,853	237,348
*Sur. after taxes & chg.	108,987	98,930
11 months' gross	5,518,718	5,160,949
Net from operation	2,840,285	2,728,725
*Sur. after taxes & chg.	1,264,275	1,220,416

*Depreciation is written off at end of each fiscal year.

REPUBLIC RAILWAY & LIGHT.

	1917.	1916.
May gross	$ 371,745	$ 326,400
Net after expenses	114,454	126,706
Other income	6,169	3,173
Total gross	$ 120,623	$ 129,880
Net after charges	37,984	61,433
Bal. after pfd. divs.	12,027	35,476
12 months' gross	4,228,747	3,523,962
Net after expenses	1,605,624	1,443,970
Other income	29,212	12,316
Total gross	$1,634,836	$1,456,287
Net after charges	738,895	713,232
Bal. after pfd. divs.	427,411	401,748

Electrical Patents Issued June 19, 1917.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,230,098. **Automatic Brake-Actuating Device for Railway-Trains.** R. Beloff, Cleveland, O. Plunger comes against rail when car body is lowered and opens circuit applying brakes.

1,230,110. **Vehicle.** C. L. Byron, Winnetka, Ill. Starting motor is employed for operating the vehicle top.

1,230,114. **Art of Electric Welding.** S. C. Cary, Brooklyn, N. Y. For lap welding thin sheet metal.

1,230,117. **Telephone-Exchange.** H. F. Clausen, assignor to Western Electric Co. Arrangement of interlocked switching mechanisms for connecting operator's set with link circuits.

1,230,150. **Auxiliary Device for Automatic Electric Control Systems.** J. V. Geraghty, New York, N. Y. Electromagnetic means for operating valves.

1,230,160. **Starting Internal-Cumbustion Engines.** O. Heins, assignor to Bosch Magneto Co., New York, N. Y. Method of reducing the maximum power required from starting motor to initial cycle of operation of engine.

1,230,170. **Telephony.** M. L. Johnson, assignor to F. B. Cook Co., Chicago, Ill. Automatic arrangement for connecting calling lines with operator's set.

1,230,172. **Automatic Circuit-Controlling Device.** J. H. Kiefer, assignor to Dayton Engineering Laboratories Co. Thermostatic circuit-breaker.

1,230,174. **Spark-Retarder for Ford Engines.** W. G. Krouse, Wyoming, Iowa. Mechanism having timer connected with cranking device to prevent advancement of spark when cranking.

1,230,175. **Electric Mechanism for Starting Automobiles and the Like.** C. B. Kurtz, Grinnell, Iowa. Gearing of dynamo electric members.

1,230,193. **Railway Signal.** A. C. Mather, Chicago, Ill. Circuit is made through sectional third rail to actuate signals on both of two vehicles in the same block.

1,230,201. **Safety Device for Moving Picture Machines.** H. S. Morton, Detroit, Mich. Has a shutter between lamp and film which is magnetically controlled by film.

1,230,209. **Gear.** G. Olson, assignor of one-half to L. Greenberg and one-sixth to W. M. McEwen, Chicago, Ill. For oscillating fan.

1,230,213. **Insulated Pipe-Joint.** O. H. Pieper and A. F. Pieper, Rochester, N. Y. Details of construction.

1,230,218. **Outlet-Box.** J. G. Raquette, Cleveland, Ohio. Structural details.

1,230,221. **Rheostat.** T. Rhodus, Chicago, Ill. Flexible, flat, circular coil has resistor wound upon it and a contact arm pivoted at the center.

1,230,247. **Burglar-Alarm.** L. Weitzman, Toronto, Ontario, Canada. Motor having its circuit controlled by door controls light and camera.

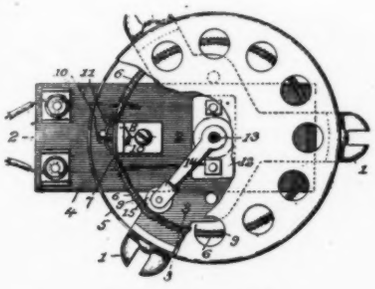
1,230,280 and 1,230,281. **Sound-Transmitting Apparatus.** A. E. Coy, assignor to Magniphone Co. Arrangements of diaphragm and damping means.

1,230,283. **Electromedical Device.** A. H. Davidson and W. C. McKellar, Huntington, W. Va. Comprises a series of rollers to alternate ones of which the opposite sides of a high-tension circuit are connected.

1,230,287. **Spark-Plug.** C. L. Freeman, assignor one-half to R. F. Hayes, Ticonderoga, N. Y. Structural details.

1,230,304. **Headlight-Dimmer.** T. F. Kiernan, Salida, Colo. Arrangement of reflector, lens and dimmer shutter.

1,230,311. **Lamp-Support and Terminal for Cloth Cutting Machines.** W. J. Marshall, assignor to H. Maimin Co., Inc.



1,230,221.—Rheostat.

Plug and socket structure and mounting for detachably securing a lamp.

1,230,342. **Electric Disinfector and Deodorizer.** R. Thornberg, San Francisco, Cal. Structure wherein a lamp acts as a volatile material.

1,230,351. **Safety Device for Motion-Picture Machines.** H. E. Watson, assignor one-half to F. B. Thompson, Richmond, Ind. Power circuit of machine is controlled by film.

1,230,357. **Device for Controlling Energy Delivered to Welding Electrodes.** H. R. Woodrow, assignor to T. E. Murray, New York, N. Y. Energy supplied is controlled by a wattmeter relay.

1,230,372. **Electric Switch.** A. J. Bowie, Jr., San Francisco, Cal. Structure of diverging-hour gap switch.

1,230,373. **Method of and Means for Preventing the Disintegration of Concrete Structures.** H. P. Brown, Montclair, N. J. For preventing destruction of reinforced concrete by electrolysis.

1,230,384. **Electric Toaster.** J. F. Delahant, New York, N. Y. Structural details.

1,230,390. **Portable Battery.** L. H. Flanders, Jenkintown, Pa. Structure of storage cell.

1,230,393 and 1,230,394. **Secondary or Storage Battery.** B. Ford, Philadelphia, Pa. First patent, structure of container. Second patent, terminals and connectors for a storage battery equipment of unitary structure.

1,230,403. **Changeable Electric Signs.** T. C. Hansen, Chicago, Ill. Arrangement of sockets, connections and reflectors in a two-faced sign.

1,230,407. **Electrical Switch.** B. D. Horton, Detroit, Mich. Mounting of removable contact carrying base in a metallic housing.

1,230,410. **Operator's Key.** W. Kaisling, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Selective ringing key for telephone system.

1,230,414. **Take-up Device for Lamp Cords.** J. A. Knapp, Fremont, Ill. Structure having a weight-operated cord drum.

1,230,421. **Automatic Telephone Exchange System.** A. E. Lundell, assignor to Western Electric Co. Structure and arrangement of an impulse-operated selector switch for extending an incoming toward an outgoing line.

1,230,429. **Electromagnetic Device.** J. C. R. Palmer and F. J. Holmes, assignors to Western Electric Co. Structural details.

1,230,434. **Automatic Timer for Starting Elevators.** G. H. Rowe, assignor to L. E. King, Berwyn, Ill. Manner of timing ascending and descending signals for a number of elevators to vary the periods of rest according to the volume of traffic.

1,230,449. **Electrical Locking Device.** S. G. Van Derbeck and H. B. Murdock, assignors to Duplex Lock Co., Inc., New York, N. Y. Details of solenoid-operated mechanism for controlling a sliding bar.

1,230,480. **Push-Button Connection for Snap-Switches.** M. Guett, assignor to Hart & Hegeman Mfg. Co., Hartford, Conn. Structural details.

1,230,497. **Impulse Motor.** L. R. McDonald, Montreal, Canada, assignor to Motion Picture Display Corpn. Structure of frictional impulse motor operated by electromagnetic impulses.

1,230,540 and 1,230,541. **Ignition System.** R. Varley, Englewood, N. J. First patent, device for automatically disconnecting the ignition circuit from battery when engine is stopped or at low speeds. Second patent, a magneto or continuous-current source may be connected with transformer, the induction relationship of primary and secondary being controlled by a single interrupter.

1,230,544. **Electrical Bond for Railways.** R. W. Walker, Milwaukee, Wis. Structural details.

1,230,553. **Telephone-Booth and the Method of Manufacturing the Same.** A.

Beran, Hirschwang, Austria. Formed of superposed layers of corrugated paper.

1,230,564. Telephone Exchange System. H. P. Clausen, assignor to Western Electric Co. Link circuits with special busy signal arrangements.

1,230,565 and 1,230,566. Telephone Exchange System. H. P. Clausen, assignor to Western Electric Co. Special ringing arrangements in manual cord systems.

1,230,578. Telephone Signaling System. E. E. Hinrichsen, assignor to Western Electric Co. Calling arrangements in manual cord systems.

1,230,582. Telephone Exchange System. L. H. Johnson, assignor to Western Electric Co. Modification of above.

1,230,598. Thermometer Unit. H. N. Packard, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Structure of electric resistance thermometer.

1,230,604. Vehicle Dash-Lamp. E. M. Rosenbluth, Philadelphia, Pa. For holding a lamp and watch in co-operative relation.

1,230,607. Protective Apparatus. T. Schidorsky, New York, N. Y. An electric luminous and audible device is attached to the leg of chair placed adjacent a door and is operated by the movement of the chair along the floor when the opening of the door pushes it along the floor.

1,230,608. Current-Deflector and System of Bank Protection. D. F. Sheldon, Ventura, Cal. Structural details of a current diversion unit and manner of arranging units.

1,230,610. High-Potential Insulator. S. S. Sonneborn, Brooklyn, N. Y. Of the condenser type.

1,230,615. Protective Device. C. P. Steinmetz, assignor to General Electric Co. For protection against high frequency disturbances.

1,230,619. Carburetor-Heating Device. O. P. Strickler and B. C. Lewis, assignors to Wonder Carburetor Heater Co. Mounting of resistor wire.

1,230,625. Electromechanical Toy. W. E. Thayer, Brooklyn, N. Y. Structure of current distributor for an electrically propelled vehicle.

1,230,626. Luminous Pendant. G. B. Thomas, assignor to Bryant Electric Co., Bridgeport, Conn. For pull sockets.

1,230,639. Semi-Automatic Telephone System. B. D. Willis, assignor to Automatic Electric Co., Chicago, Ill. Arrangement of operators' board, automatic

1,230,643. Cover-Plate for Flush Receptacles. C. E. Anderson, assignor to Bryant Electric Co., Bridgeport, Conn. Structure of device comprising a facing sheet of soft metal and a lining of hard metal.

1,230,645. Illuminating Appliance. F. A. Andrews and T. G. Allen, Westminster, London, England. Structure of lamp enclosing bell.

1,230,662. Electric-Light Socket. A. H. Buckelew, New York, N. Y., assignor of one-fourth to V. C. Gilpin and one-fourth to J. E. McAuliffe, Brooklyn, N. Y. Manner of securing shell to cap.

1,230,669. Dimming Headlight-Lens. U. G. Cassady and L. W. George, assignors to Primolite Co., Indianapolis, Ind. Has special arrangement of translucent and prismatic portions.

1,230,670. Dimming-Lens for Headlights. U. G. Cassady, assignor to Primolite Co. Modification of above.

1,230,676. Sound-Reproducer. J. J. Comer, assignor to Automatic Enunciator Co., Chicago, Ill. Structural arrangement of permanent and electromagnets and diaphragm.

1,230,680 and 1,230,681. Protection of Transmission Systems. E. E. F. Creighton, assignor to General Electric Co. First patent, for protecting against high-voltage stresses due to intermittent ground connection. Second patent, for protection against arcing grounds.

1,230,694. Two-Wire to Three-Wire Telephone System. E. D. Fales, assignor to Automatic Electric Co., Chicago, Ill. Automatic.

1,230,708. Vapor Electric Apparatus. P. C. Hewitt, assignor to Cooper-Hewitt Electric Co., Hoboken, N. J. Structural details.

1,230,721. Illuminated Pencil. E. V. Kelly, Vedado, Habana, Cuba. Is fitted with a battery lamp.

1,230,727. Dining-Table Plate Heating Appliance. W. W. Kuhlmann, Woodcliffe-on-Hudson, N. J. Details of dirk-like structure.

1,230,728. Voltage-Regulator. H. A. Laycock, assignor to General Electric Co. Vibratory circuit interrupter.

1,230,737. Lighting-Fixture. W. Lumley, assignor to General Electric Co. An electrical connection at a fixture junction part.

1,230,742. Clamp. A. McMurtrie, assignor to Thomas & Betts Co., New York, N. Y. Grounding clamp for securing gas pipe.

1,230,786. Plate-Remover for Storage Batteries. R. F. Robertson, Philadelphia, Pa. Adapted to be placed on battery casing and is adjustable for different sized casings.

1,230,787. Automobile-Alarm. C. E. Robison and M. Askin, Philadelphia, Pa. Details of contact device, one of the contacts comprising a depending weight.

1,230,788. Electric Heater for Steering Wheels. E. J. Rohne, Minneapolis, Minn. Flexible ribbon-like heater is wound about the rim.

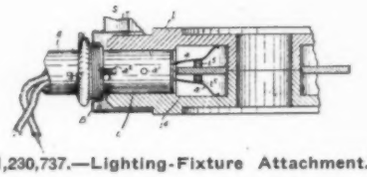
1,230,795, 1,230,796 and 1,230,797. Spark-Plug. A. Schmidt, assignor to Champion Ignition Co., Flint, Mich. Structural details.

1,230,807. Telegraph Sending and Recording Device. L. C. Shearer, Latrobe, Pa. Structure of sending key with a recording tape and punch.

1,230,810. Signal. J. Shiflet, McKeesport, Pa. Arm operating solenoid has special contact structure for controlling circuit signal lamp.

1,230,815. Splash System of Lubrication. F. A. Smith, East Orange, N. J. Parts of oil-circulating structure form magneto connections.

1,230,826. Circuit-Completing Plug for



1,230,737.—Lighting-Fixture Attachment.

Lamp Sockets. J. L. Campbell, Barryton, Mich. Details of construction.

Reissues.

14,317. Generator Suspension. R. M. Dixon, assignor to Safety Car Heating & Lighting Co. For car lighting systems.

14,319. Electric Riveting Apparatus. F. P. Lobert, Amityville, N. Y., assignor to International Electric Riveter Co. Mechanism for depressing electrode upon work and controlling the circuit.

PATENTS EXPIRED.

The following United States electrical patents expired on June 26, 1917:

652,266. Electromagnetic Brake. E. M. Hedd, Pittsburg, Pa.

652,270. Pneumatic Transfer-Tube-System. W. A. Houghtaling, New York City.

652,272. Telephone Toll System. J. A. Johnson, Waveland, Ind.

652,278. Motor Vehicle. F. A. La Roche, New York City.

652,301. Elevator. W. C. Stokes, New York City.

652,302. Device for Electrically Operating Bulkhead Doors. A. H. Thomas, Philadelphia, Pa., and F. B. Richmond, Camden, N. J.

652,309. Battery Compound. H. Blumenberg, Jr., New York City.

652,333. Electrical Signal. J. H. Sanor, Canton, Ohio.

652,340. Globe for Indicating Trade Routes, etc. E. Vohson, Berlin, Germany.

652,360. Motor Rheostat. J. L. Hall, Schenectady, N. Y.

652,374. Incandescent Lamp for Electric Lights. J. F. Sanders, Chicago, Ill.

652,385. Secondary Battery. C. J. Coleman, Chicago, Ill.

652,389. Waterwheel Governor. W. W. Handy, Baltimore, Md.

652,390. Electric Governor. W. W. Handy, Baltimore, Md.

652,419. Electric Tramway. E. Bonnet and Jules Paufique, Lyons, and George Liniere, Ecully, France.

652,422. Apparatus for Setting Lines of Type or Matrices. H. Burg, Mollkirch, Germany.

652,430. Electric Hand-lighting Gas Burner. G. J. Galbraith, Boston, Mass.

652,432. Telephone System. C. C. Gould, Philadelphia, Pa.

652,436 and 652,437. Thermoelectric Battery or Pile. J. Matthias, Stuttgart, Germany.

652,438. Electric-Railway System. L. M. Maxham, Boston, Mass.

652,446. Electromedical Bath. J. J. Stanger, Ulm, Germany.

652,453 and 652,454. Alternating Current Electric Meter. E. Batault, Geneva, Switzerland.

652,459. Electric Circuit. C. C. Gould, Philadelphia, Pa.

652,485. Combined Gear Muffler and Shunt for Magneto-Generators. J. G. Nolen, Chicago, Ill.

652,494. Electric-Lighting Apparatus. C. A. Terry, New York City.

652,504. Electric Heater. E. Bennett, Jeanette, Pa.

652,508. Microphone Transmitter. C. B. Clark and C. E. Clark, Sing Sing, N. Y.

652,564. Subterranean Current Distribution for Electric Street Cars. Eduard von Mairhofen, Wurzburg, Germany.

652,580. Electric Lamp. S. B. Apostoloff, London, England.

652,595. Telegraphic Transmitting Apparatus. F. G. Creed, Glasgow, Scotland.

652,596. Switch for Electric Circuits. E. I. Dodds, Avalon, Pa.

652,597. Switch for Lamp Circuits. E. I. Dodds.

652,598. Snap Switch for Electric-Lamp Circuits. E. I. Dodds.

652,599. Automatic Push-Button Switch for Electric Lamps. E. I. Dodds.

652,600. Knife Switch for Electric-Lamp Circuits. E. I. Dodds.

652,601. Cut-outs for Electric-Lamp Circuits. E. I. Dodds.

652,607. Electric-Lighting Apparatus. M. W. Hanks, Pittsburg, Pa.

652,608. Multiple Glower Lamp. M. W. Hanks.

652,609. Glower Terminal for Electric Incandescent Lamp. M. W. Hanks.

652,610. Electric Lighting Apparatus. M. W. Hanks.

652,611. Combined Diaphragm and Electrode. J. Hargreaves, Farnworth-in-Widnes, England.

652,626. Heater Cut-out Device for Electric Lamps. W. Vernst and H. N. Potter, Gothingen, Germany.

652,634. Automatic Heater-Operating Device for Lamp Circuits. H. N. Potter.

652,635. Electric Heater and Supporting Material Therefor. H. N. Potter.

652,636. Controlling System for Electric Lamp Heaters. H. N. Potter.

652,637. Process for Forming Tubes. H. N. Potter.

652,638. Heater for Electric Glower Lamps. H. N. Potter.

652,639. Heater Cut-out Device for Electric Lamps. H. N. Potter.

652,640. Electric Furnace. H. N. Potter.

652,671. Insulated Electrical Conductor and Cable. H. Edmunds, London, England.

652,673. Motor Vehicle. J. Griffe, Paris, France.

652,676. Aerial Switch for Electric Railways. O. Jocdicke, Mulhausen, Germany.

652,699. Multiple-Glower Lamp. A. J. Wurts, Pittsburgh, Pa.

652,700 and 652,701. Igniting and Lighting System for Electric Lamps. A. J. Wurts.

652,702. Circuit-Breaker for Glower Lamps. A. J. Wurts.

652,703. Removable Part for Glower Lamps. A. J. Wurts.

652,704. Electric Lamp and Fixture. A. J. Wurts.

652,705. Heater-Tube Support for Electric Lamps. A. J. Wurts.

652,706. Means for Heating High-Voltage Glowers. A. J. Wurts.

652,707. System of Distribution for Electric Lighting. A. J. Wurts.

652,734. Alarm System. C. Coleman, Chicago, Ill.

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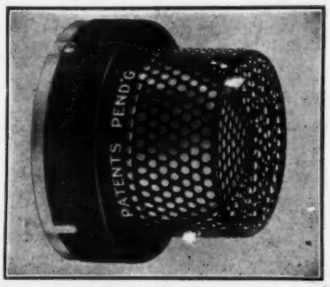

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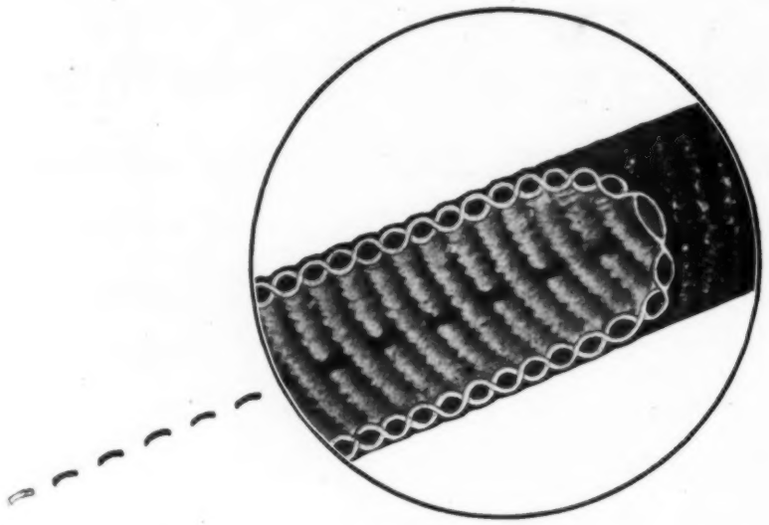

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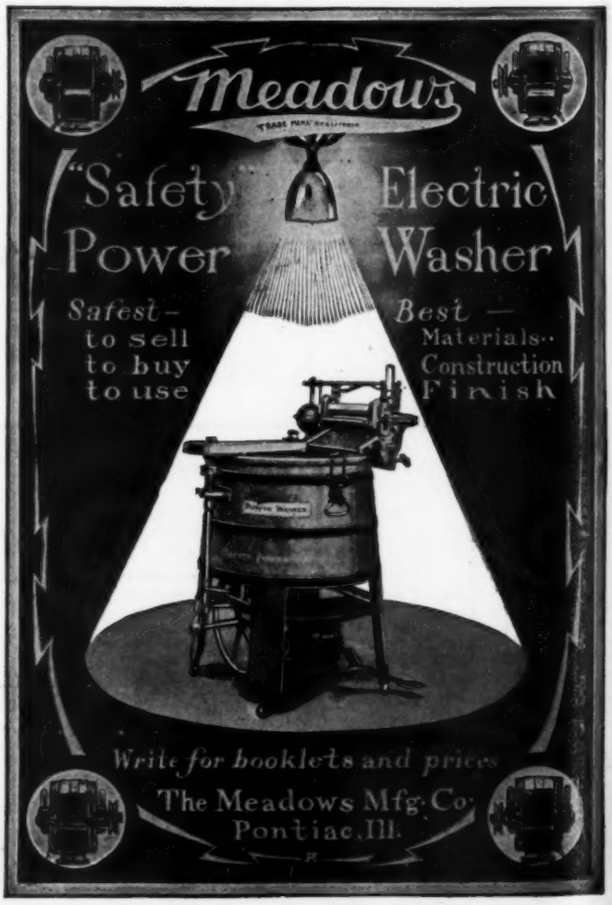

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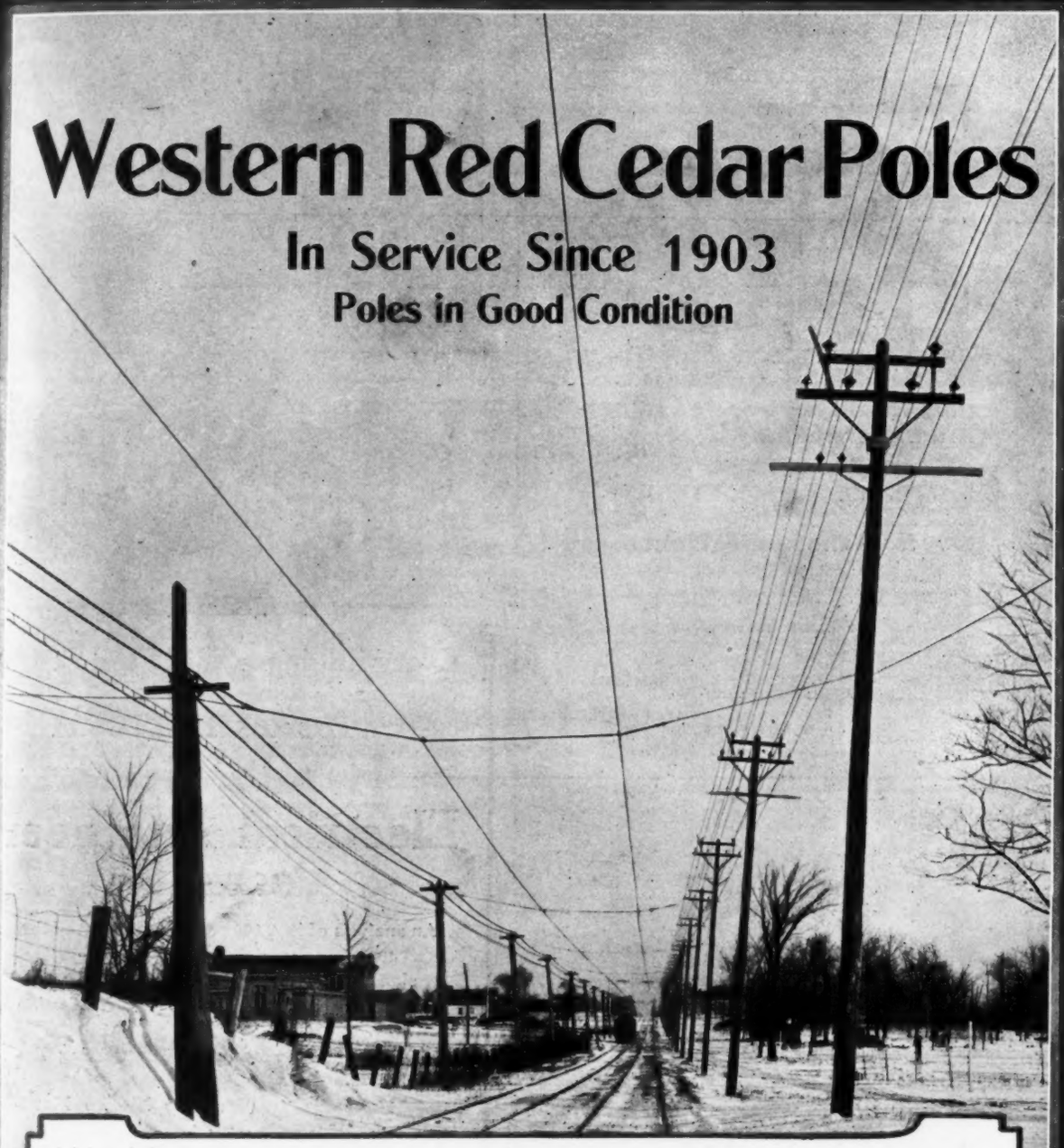

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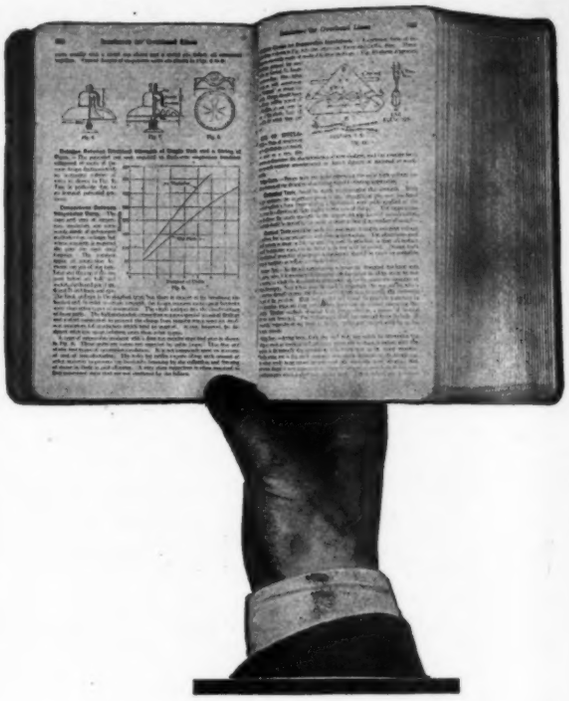

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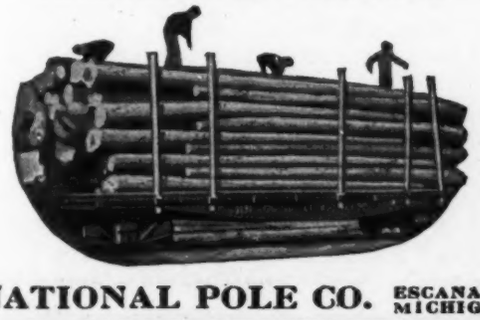

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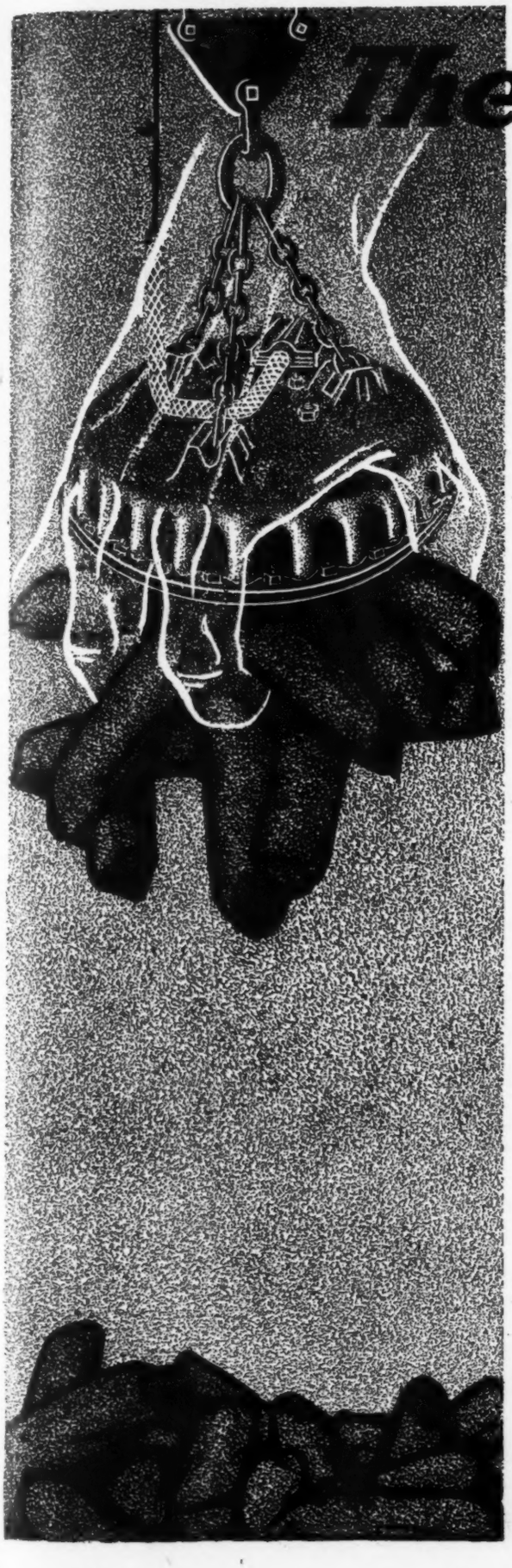

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THE E. C. & M.
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FORM A

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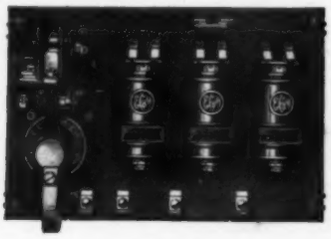

FORM AS

Remote Control, No-Voltage Protection, Automatic Acceleration Secured by Series-Wound Accelerating Contactors, Operates with Push Button.

FORM ASB

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FORM AK

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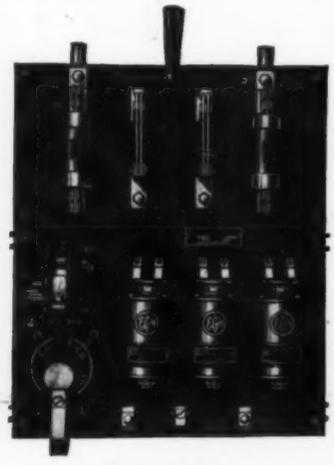

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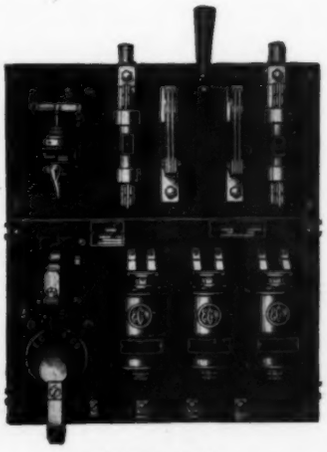

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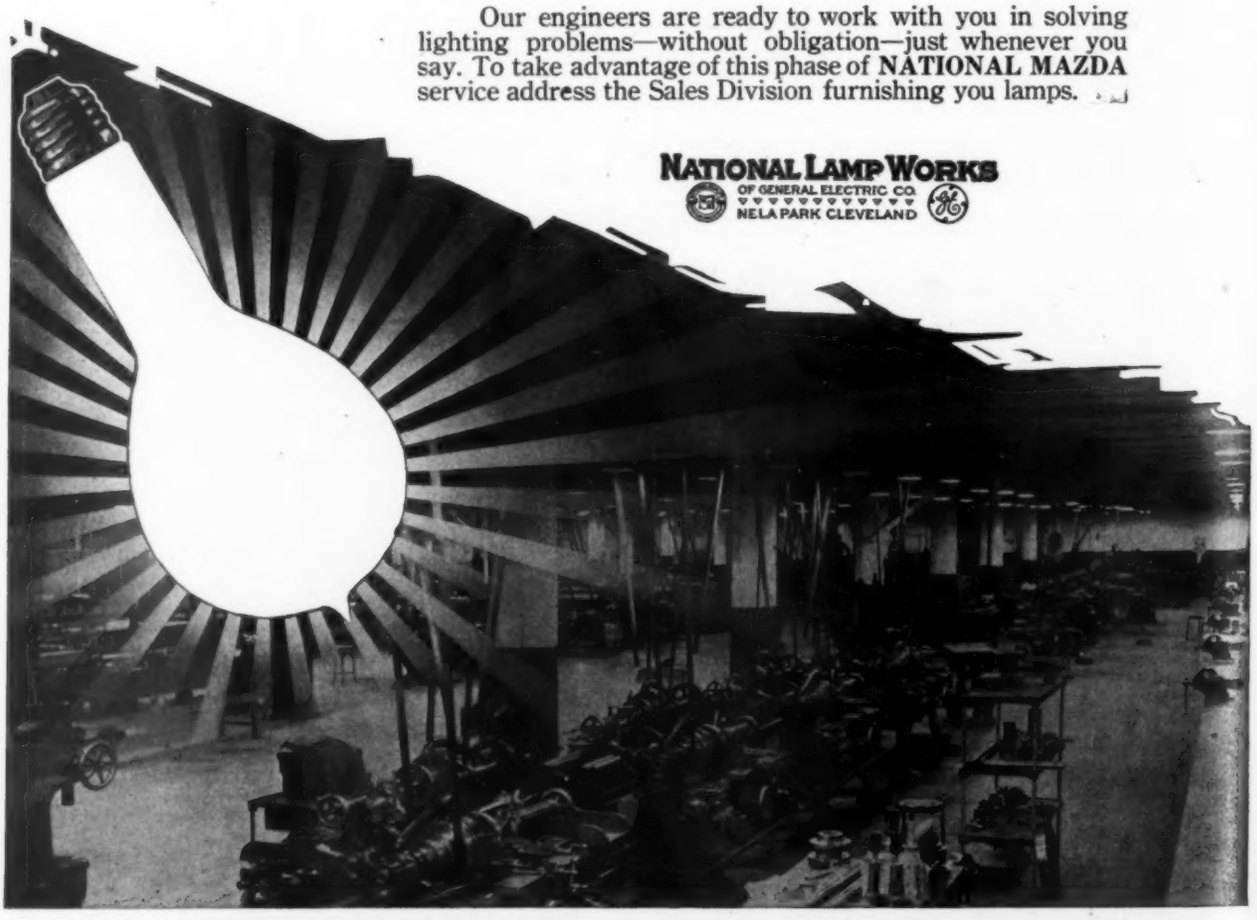

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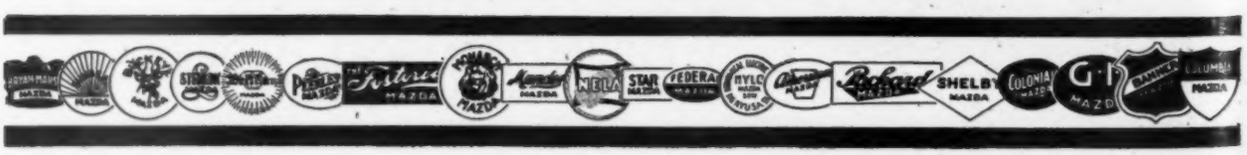

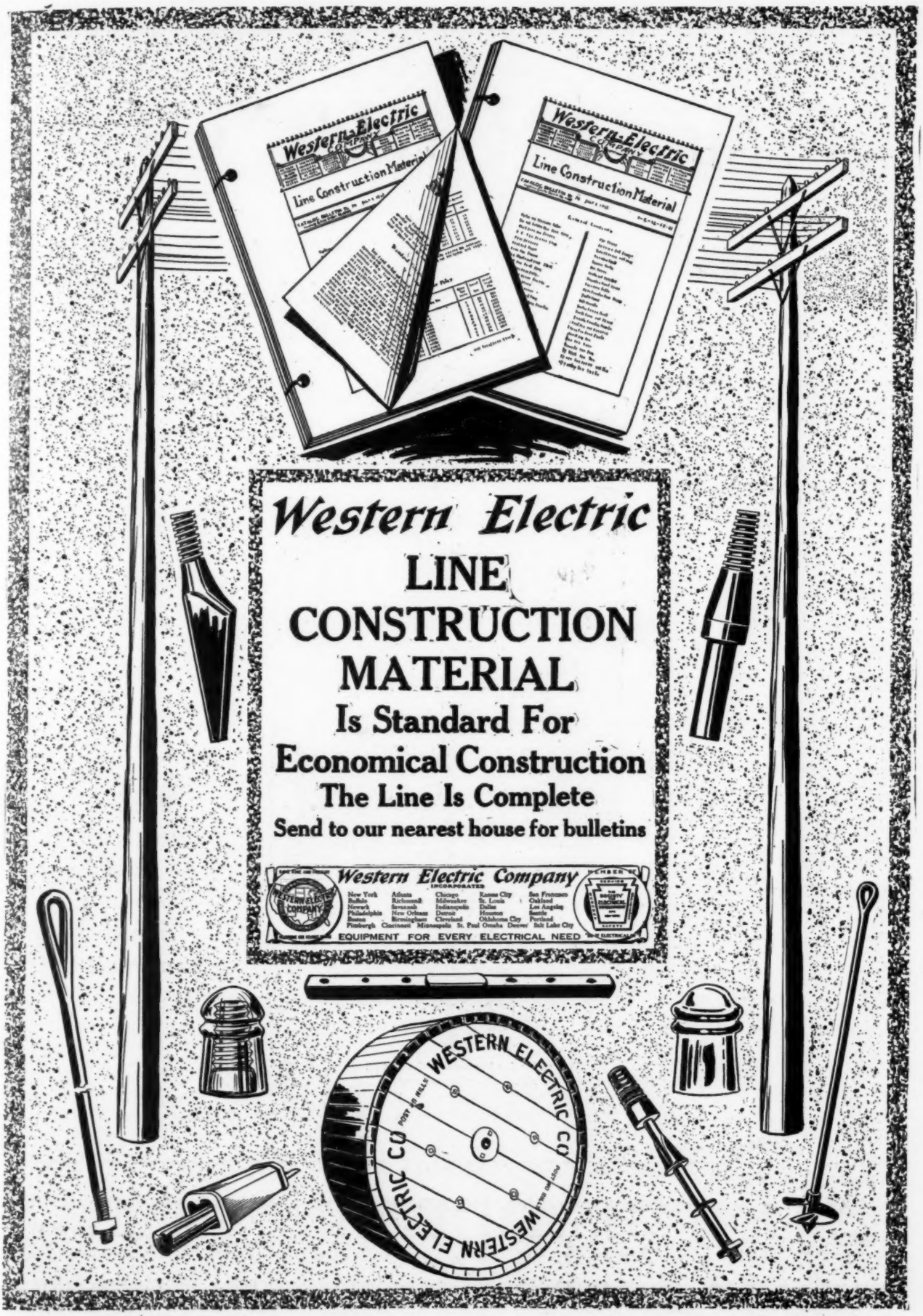
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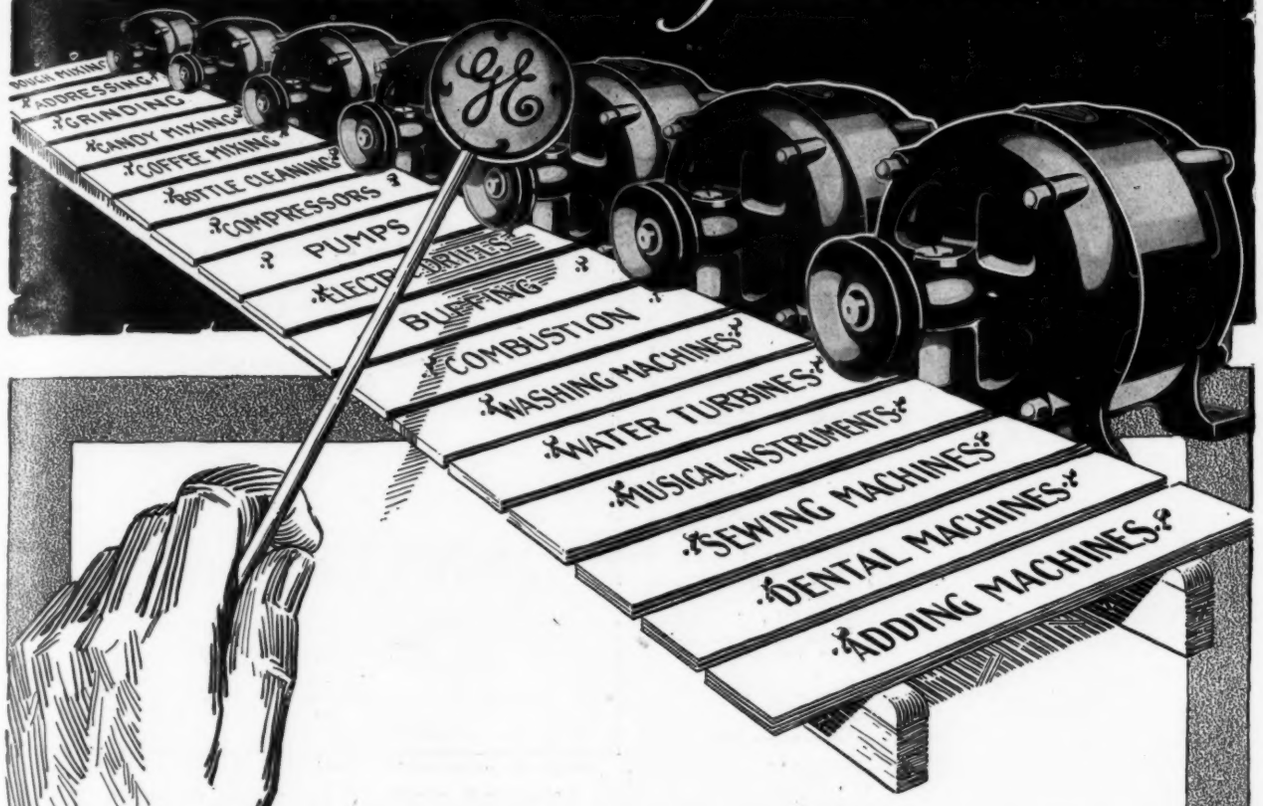

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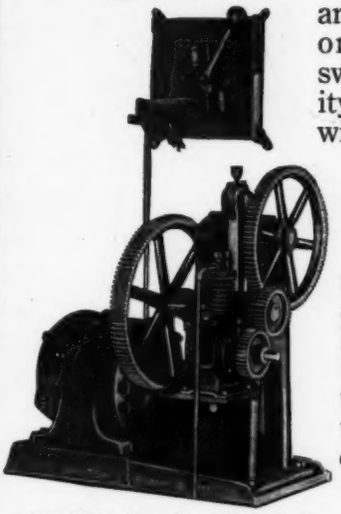

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are ready to work on closing the switch. Their ability to successfully withstand the frequent starting required by coffee mills, house pumps, air compressors, and heat regulators is among the reasons for their wide adoption for this class of service.

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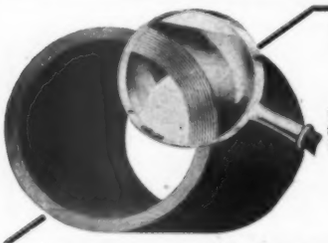

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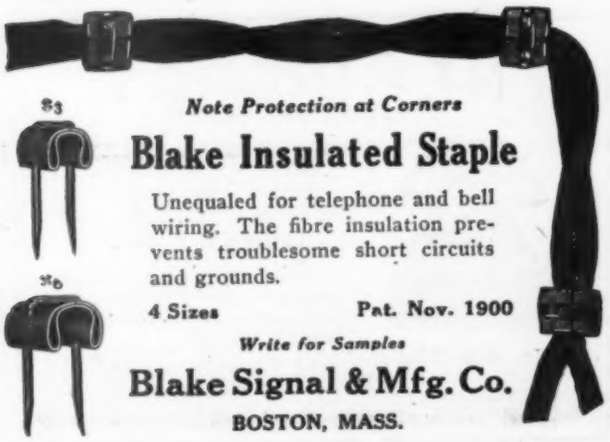

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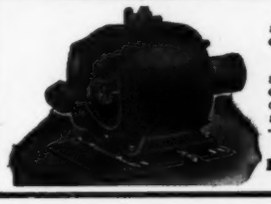

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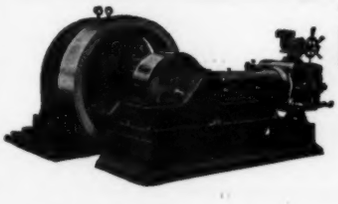

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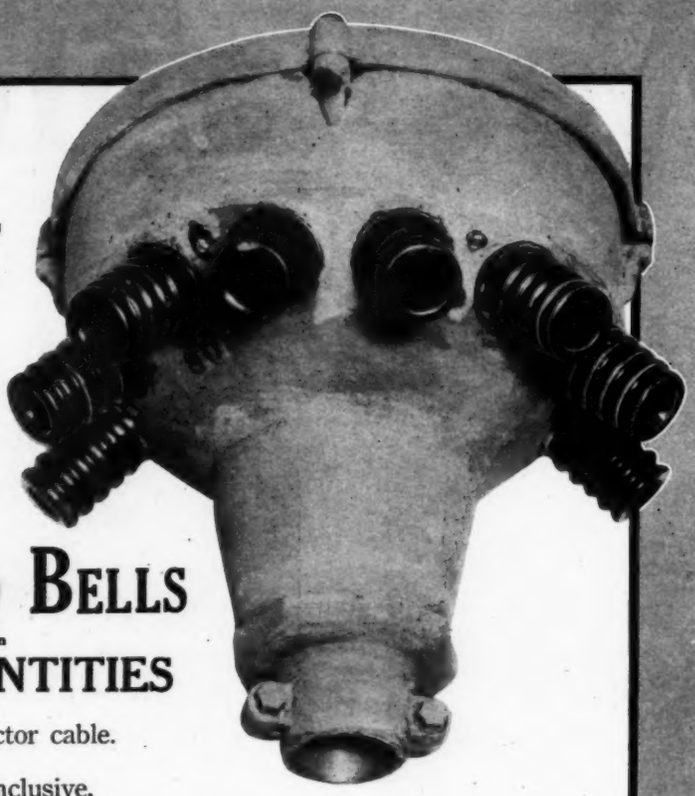

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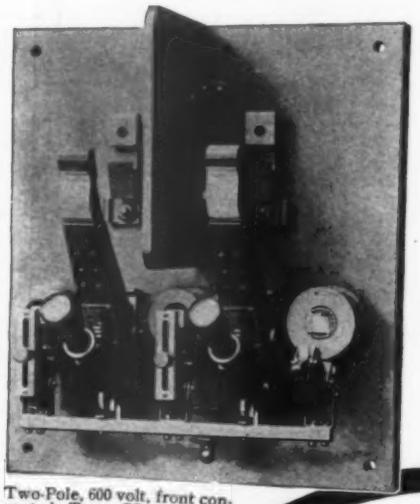
Westinghouse

Type CD Carbon Circuit Breakers



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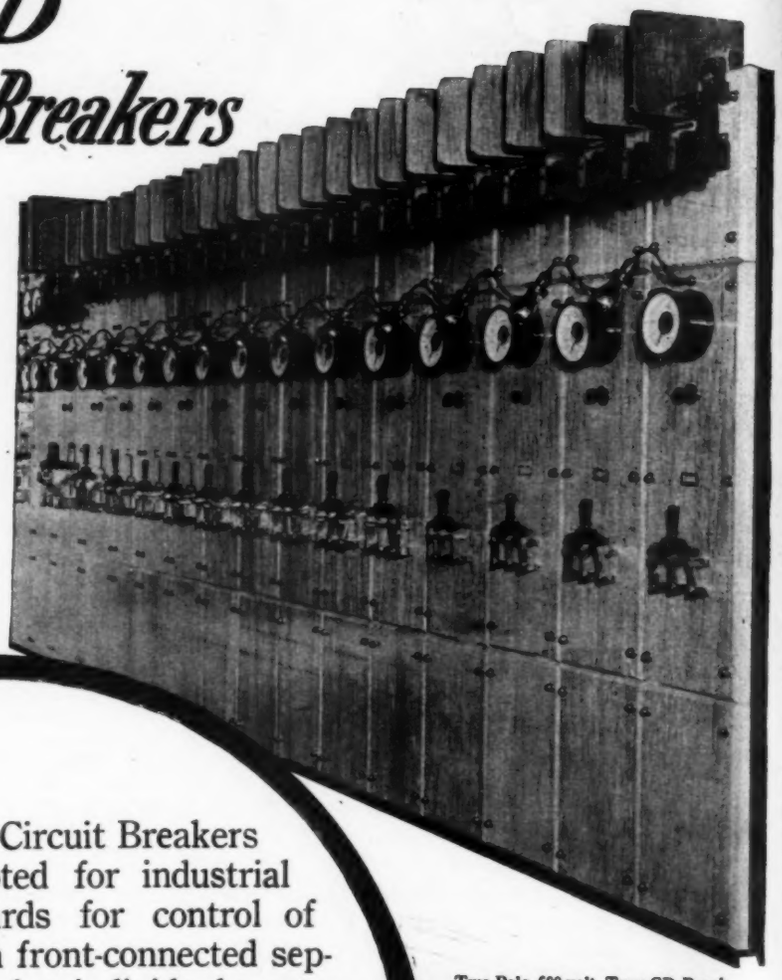

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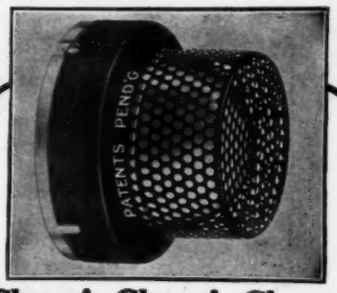

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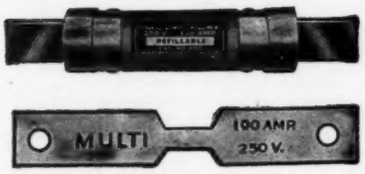

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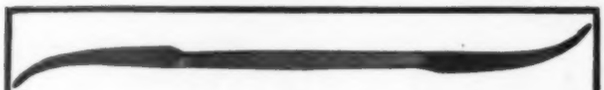

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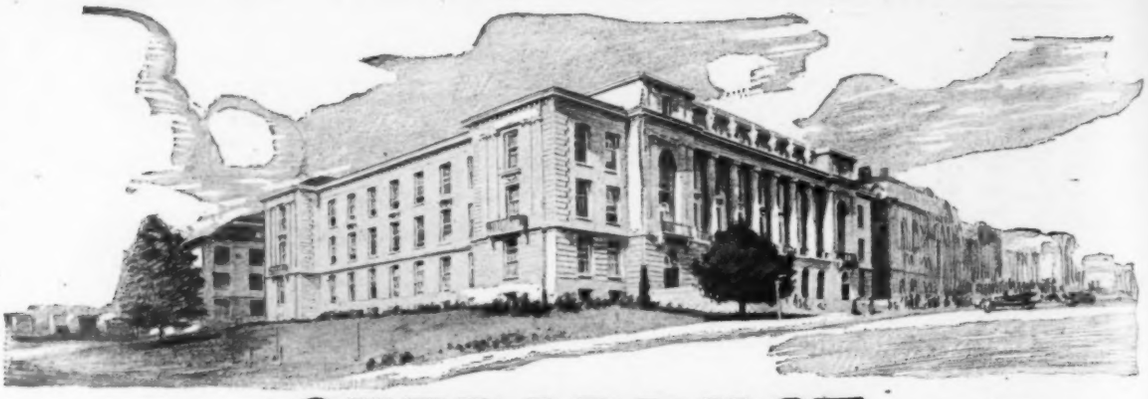

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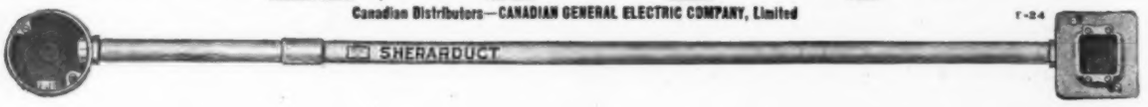

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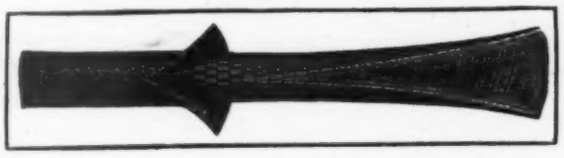

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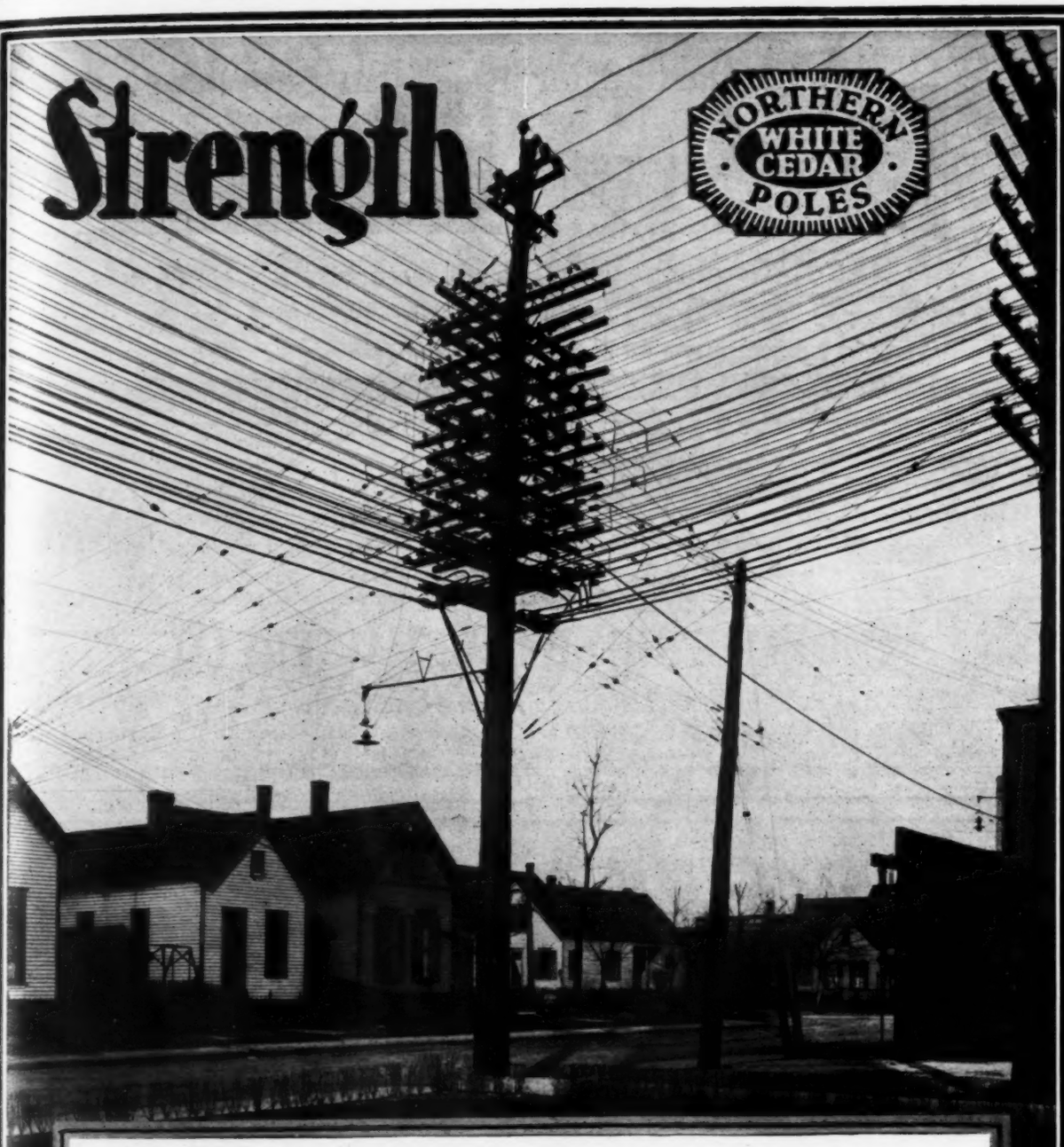

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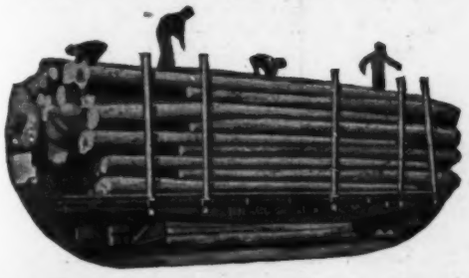
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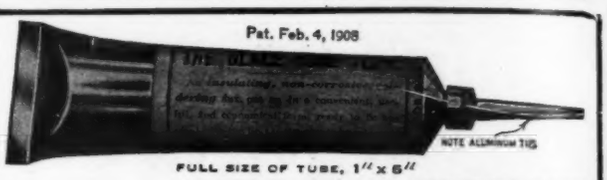

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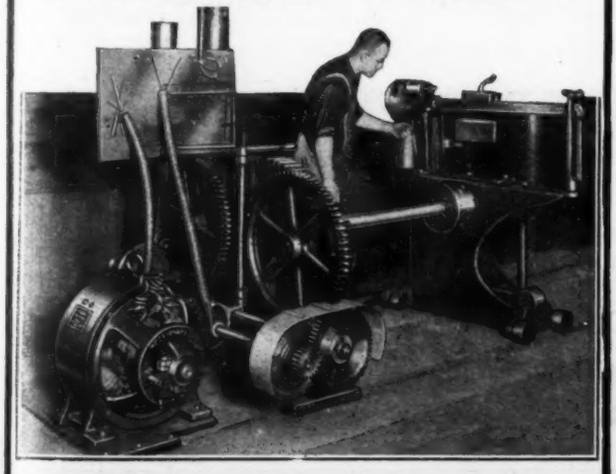

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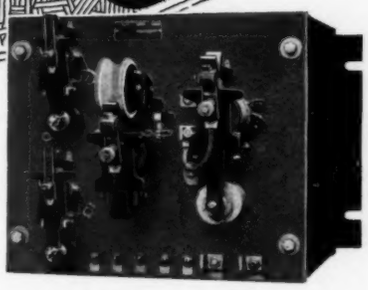

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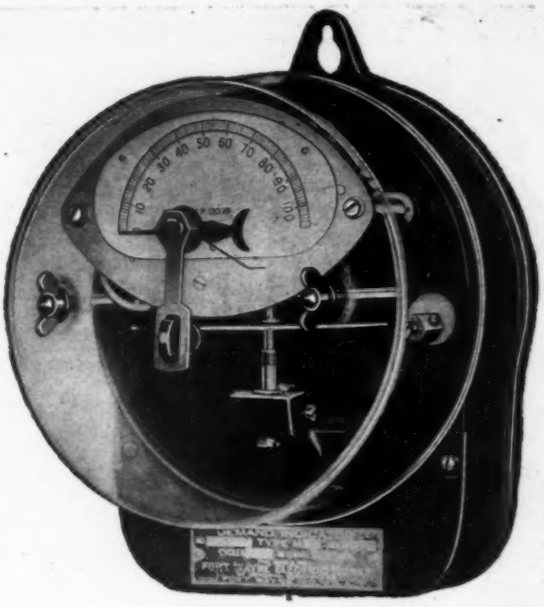

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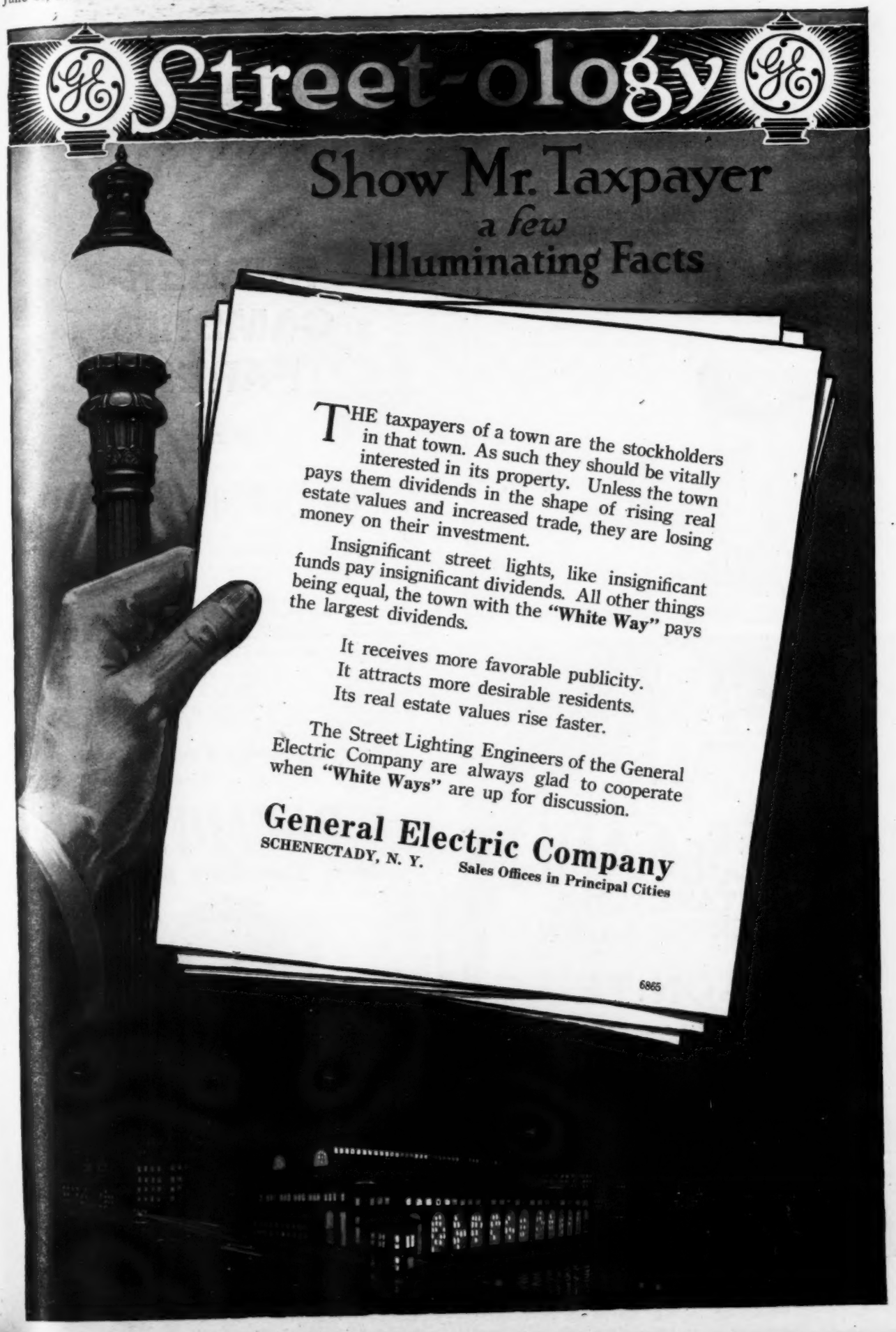
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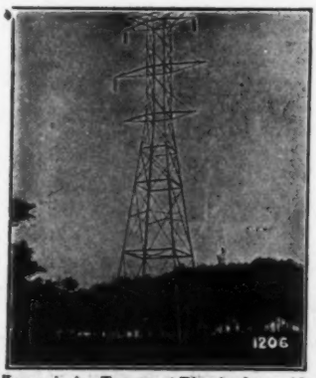

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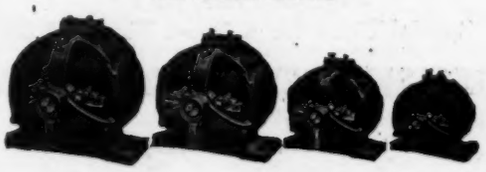

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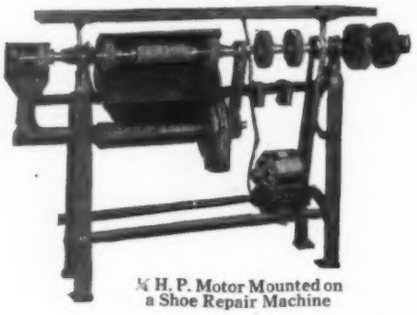

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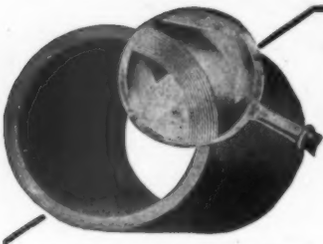

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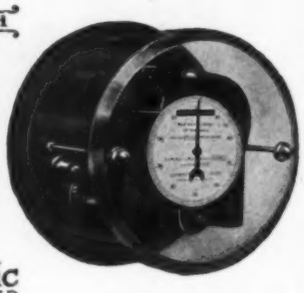

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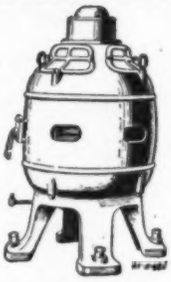

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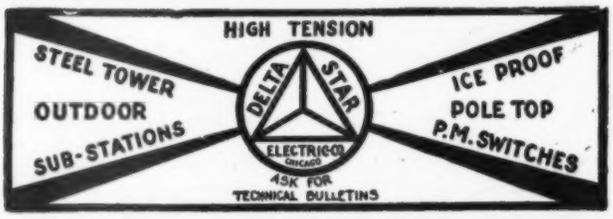

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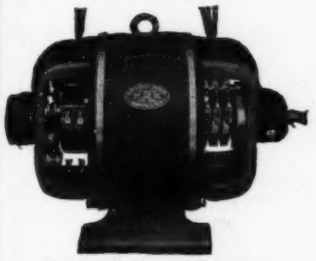

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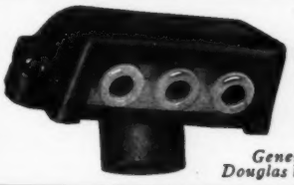

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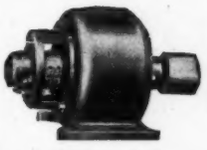

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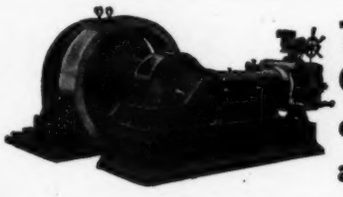

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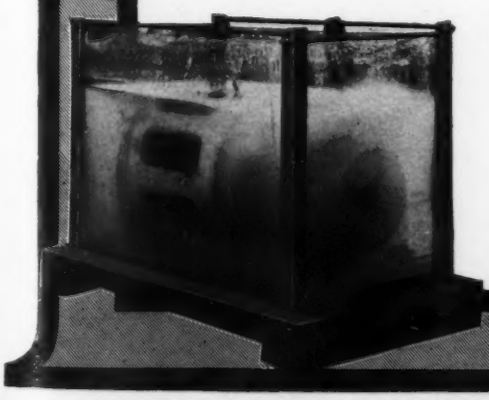
Dry Docks
Locomotive Shops
Any plant where steel parts are joined or breakage and defects repaired.



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Pittsburgh
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Toronto, Canada

Agencies in other principal cities

Westinghouse

Switchboards and Switch Gear

Buffalo General Electric Co's New, River Steam Station

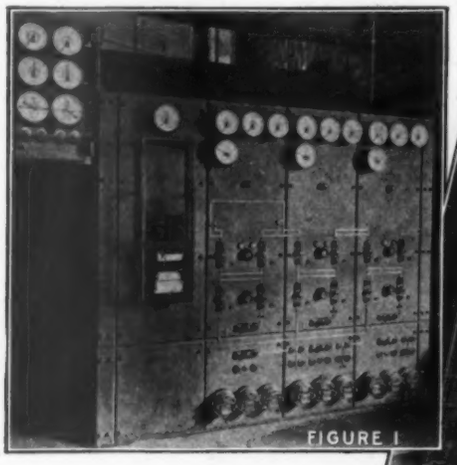
FIGURE 1

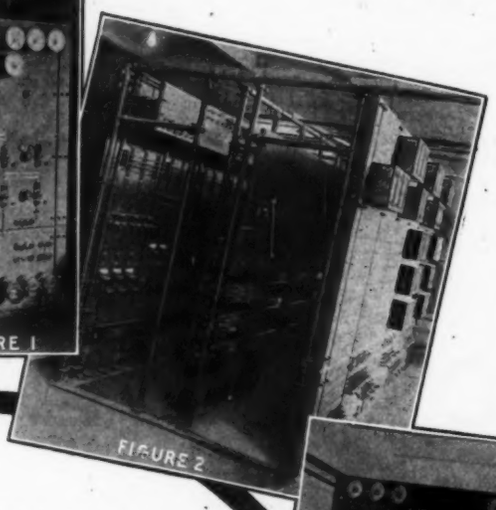
FIGURE 2

66,666 Kva. (Initial)
233,000 Kva. (Ultimate)

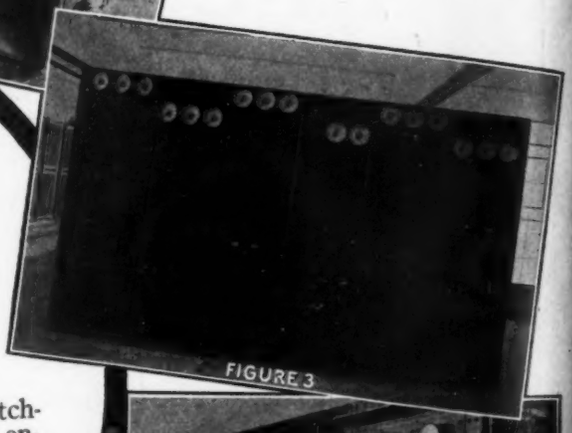
FIGURE 3

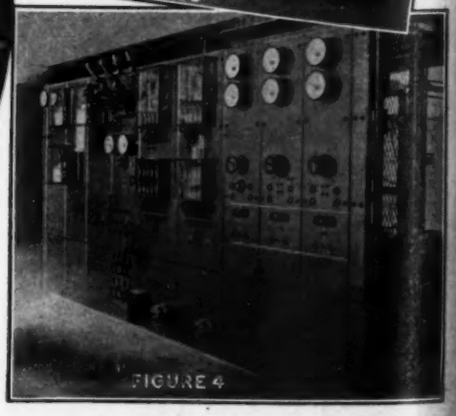
FIGURE 4

Figure 1 illustrates the main generator control board; Figure 2 its relay and watt-hour meter panels to rear; Figure 3 the alternating-current feeder board; and Figure 4 the exciter, voltage regulator and direct-current local service board.

With these, for initial 66,666 kva. generating capacity, as part of the main switch gear (all Westinghouse) for this immense station, were included twelve 2,000 ampere type 0-2, and seventeen 600 amperes Type 0-1 Oil Circuit Breakers.

The satisfaction given by this Westinghouse Switchboard Equipment, to both customer and consulting engineers, (Stone & Webster, Engineering Corporation) is evidenced by a contract just placed for additional Westinghouse Switchboard Equipment to control a new and additional 38,000 kva. generator. Included are three 3,000 ampere, Type 0-2, and six 600 ampere Type 0-1 Oil Circuit Breakers.

This is further evidence of Westinghouse Switchboard Quality.

Westinghouse Electric & Manufacturing Co.
East Pittsburgh, Pa.
Sales Offices in all Large American Cities
665

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